

## ORDINARY DIFFERENTIAL EQUATIONS

Semester	Subject Code	Category	Lecture		Theory	Practical	Credits
			Hrs/Week	Hrs/Sem			
I	21CPMA1C	Core	6	90	6	0	5

### COURSE OBJECTIVES:

The students will be able to

- Develop strong background on finding solutions to linear differential equations with constant and variable coefficients and also with singular points
- Study existence and uniqueness of the solutions of first order differential equations.

### COURSE OUTCOMES:

On the successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level(K1-K4)
CO1	Obtain solutions of the Homogenous equation with constant co-efficient and Homogenous equation with analytic co-efficient and using Wronskian to find a solution of the problems.	K2
CO2	Obtain the solution of Homogenous and Non- homogenous equation of order n and also to find the solution of non-homogenous equation using Annihilator method.	K3
CO3	Solving Initial value problems and to derive the homogenous equation with analytic coefficient and also obtain the solution of Legendre equation and related problems.	K4
CO4	Comprehend the Euler equations, the Bessel equation and second order equations with regular singular points.	K2
CO5	Analyze the problems in Exact equation and method of convergence of the successive approximations and study about Lipschitz condition.	K3

*Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze.*

### MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	S	M	S
CO2	M	M	S	M	S	M
CO3	S	S	S	M	S	S
CO4	M	M	M	M	M	S
CO5	S	M	S	S	S	M

S- Strong; M- Medium; L- Low

**UNIT I - LINEAR EQUATIONS WITH CONSTANT COEFFICIENTS** **18 Hours**

Second order homogeneous equations – Initial value problems – Linear dependence and independence – Wronskian and a formula for Wronskian – Non – homogeneous equation of order two.

**Chapter - 2: Sections 1 to 6.**

**UNIT II - LINEAR EQUATIONS WITH CONSTANT COEFFICIENTS** **18 Hours**

Homogeneous and non – Homogeneous equation of order  $n$  – Initial value problems – Annihilator method to solve non – homogeneous equation – Algebra of constant coefficient operators.

**Chapter- 2: Sections 7 to 12.**

**UNIT III - LINEAR EQUATIONS WITH VARIABLE COEFFICIENTS:** **18 Hours**

Initial value Problems – Existence and uniqueness theorems – Solutions to solve a non – homogeneous equation – Wronskian and linear independence – reduction of the order of a homogenous equation – homogeneous equation with analytic coefficients – The Legendre equation.

**Chapter- 3: Sections 1 to 8 [Omit Section 9]**

**UNIT IV - LINEAR EQUATIONS WITH REGULAR SINGULAR POINTS:** **18 Hours**

Euler equation – Second order equations with regular singular points – Exceptional cases – Bessel Equation.

**Chapter – 4: Sections 1 to 4 and 6 to 8 [Omit sections 5 and 9]**

**UNIT V - EXISTENCE AND UNIQUENESS OF SOLUTIONS TO FIRST ORDER EQUATIONS:** **18 Hours**

Equations with variables separated – Exact equations – method of successive approximations – the Lipschitz condition – convergence of the successive approximations and the existence theorem.

**Chapter – 5: Sections 1 to 6 [Omit sections 7 to 9].**

**DISTRIBUTION OF MARKS: THEORY 70% AND PROBLEMS 30%.**

**TEXT BOOK:**

S.No	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	Earl A. Coddington	An Introduction to Ordinary Differential Equations	PHI learning Private Limited, New Delhi.	2009

**REFERENCE BOOKS:**

S.No.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	Williams E. Boyce and Richard C. Di Prima	Elementary differential equations and boundary value problems	John Wiley and sons, New York	1967
2	George F Simmons	Differential equation with applications and historical notes	Tata McGraw Hill, New Delhi	1974
3	N.N. Lebedev	Special functions and their application	Prentice Hall of India, New Delhi	1965
4	W.T. Reid	Ordinary Differential Equations,	John Wiley and Sons, New York	1971
5	M.D.Raisinghanian	Advanced Differential Equations	S.Chand&Company Ltd. New Delhi	2001
6	B.Rai, D.P.Choudary and H.I Freedman	A Course in Ordinary Differential Equations,	Narosa Publishing House, New Delhi,	2002

**WEB SOURCES:**

1. [http://www.amazon.com/Ordinary-differential-equation-Dover-Mathematics/dp/6486649407/ref=sr\\_1\\_1?](http://www.amazon.com/Ordinary-differential-equation-Dover-Mathematics/dp/6486649407/ref=sr_1_1?)
2. <https://open.umn.edu/open-text-books/text-books/Ordinary-differential-equation>

**TEACHING METHODOLOGY:**

1. Class room Teaching
2. Assignments
3. Seminars
4. Discussions
5. PPT Presentations.

**SYLLABUS DESIGNER:**

1. Mrs. B. Vijayalakshmi, Assistant Professor of Mathematics.