

	P.R. Government College (Autonomous): KAKINADA	Program & Semester Major & Minor (II Sem) w.e.f. 2023-24 admitted Batch			
Course Code MAT-201	TITLE OF THE COURSE Differential Equations & Problem Solving Session				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic Mathematics Knowledge	3	0	0	3

Course Objectives:

To provide students with an introduction to the theory of ordinary differential equations through applications, methods of solution, and numerical approximations.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Solve linear differential equations
CO2	Convert non - exact homogeneous equations to exact differential equations by using integrating factors.
CO3	Know the methods of finding solutions of differential equations of the first order but not of the first degree.
CO4	Understand the concept and apply appropriate methods for solving differential equations.

Course with focus on employability/entrepreneurship /Skill Development modules

Skill Development		Employability		Entrepreneurship	
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COURSE SYLLABUS:

UNIT – I: Differential Equations of first order and first degree

Linear Differential Equations; Differential equations reducible to linear form; Exact differential equations; Integrating factors, Equations reducible exact equations by integrating factors:

1. Inspection Method
2. $1 / Mx + Ny$
3. $1 / Mx - Ny$

UNIT – II: Orthogonal Trajectory and Differential Equations of first order but not of the first degree

Differential Equations of first order but not of the first degree :

Equations solvable for p; Equations solvable for y, Equations solvable for x - Clairaut's Equation.

Orthogonal trajectories : Cartesian and polar co-ordinates.

UNIT – III: Higher order linear differential equations

Solution of homogeneous linear differential equations of order n with constant coefficients;
Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators.

P.I. of $f(D)y = Q$ when $Q = e^{ax}$

P.I. of $f(D)y = Q$ when Q is $b \sin ax$ or $b \cos ax$.

UNIT – IV: Higher order linear differential equations (continued)

Solution of the non-homogeneous linear differential equations with constant coefficients. P.I. of $f(D)y = Q$ when $Q = bx^k$

P.I. of $f(D)y = Q$ when $Q = be^{ax} V$

P.I. of $f(D)y = Q$ when $Q = xV$

UNIT –V: Higher order linear differential equations with non-constant coefficients

Linear differential equations with non-constant coefficients : The Cauchy-Euler Equation ;Legender's Equations, Method of variation of parameters.

Activities

Seminar/ Quiz/ Assignments/ Applications of Differential Equations to Real life Problem /Problem Solving Sessions.

Text Book

Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Pvt. Ltd, New Delhi-Second edition.

Reference Books

1. Ordinary and Partial Differential Equations by Dr. M.D. Raisinghania, published by S. Chand &Company, New Delhi.
2. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha-Universities Press.

3. Differential Equations -Srinivas Vangala&Madhu Rajesh, published by Spectrum University Press.

Additional Inputs :

Total Differential Equations

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' :NoCorrelation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PS01	PS02	PS03
CO1	3	3	2	3	3	3	1	2	2	3	2	3	2
CO2	3	2	3	3	2	3	3	1	3	3	3	2	1
CO3	2	3	2	3	2	3	2	2	2	3	2	2	3
CO4	3	2	3	2	2	2	3	3	1	1	3	1	2

BLUE PRINT FOR QUESTION PAPER PATTERN**COURSE-I, DIFFERENTIAL EQUATIONS**

Unit	TOPIC	S.A.Q	E.Q	Marks allotted to the Unit
I	Differential Equations of first order and first degree	2	2	20
II	Orthogonal Trajectory and Differential Equations of first order but not of the first degree	2	1	20
III	Higher order linear differential equations	1	1	15
IV	Higher order linear differential equations (continued)	1	1	15
V	Higher order linear differential equations with non-constant coefficients	1	1	15
Total		7	6	95

S.A.Q. = Short answer questions (5 marks)

E.Q = Essay questions (10 marks)

Short answer questions : 4 X 5 = 20 M

Essay questions : 3 X 10 = 30 M

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Total Marks = 50 M

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P.R. GOVT. COLLEGE (AUTONOMOUS), KAKINADA
I year B.Sc., Degree Examinations - I Semester
Mathematics Course-I: Differential Equations
(w.e.f. 2023-234Admitted Batch)
Model Paper (w.e.f. 2023-2024)

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Time: 2 Hours

Max Marks: 50M

Section -I

Answer any three of the following questions. Must attempt atleast one question from each part. Each question carries 10 Marks.

3 X 10 =

30M

Part – A

1. Solve $(1 + xy)x \, dy + (1 - xy)y \, dx = 0$.
2. Solve $\frac{dy}{dx}(x^2y^3 + xy) = 1$
3. Solve $p^2 + 2py \cot x = y^2$

Part - B

4. Solve $(D^2 - 4D + 3)y = \sin 3x \cos 2x$.
5. Solve $(D^2 - 4D + 4)y = 8x^2 e^{2x} \sin 2x$
6. Solve $[(1 + x)^2 D^2 + (1 + x)D + 1]y = 4 \cos \log(1 + x)$.

Section II

Answer any four of the following questions. Each question carries 5 marks. 4 X 5 = 20M

7. Solve $(y - e^{\sin^{-1}x}) \frac{dx}{dy} + \sqrt{1 - x^2} = 0$
8. Solve $(e^y + 1) \cos x \, dx + e^y \sin x \, dy = 0$.
9. Find the Orthogonal trajectories of family of curves $r = a(1 + \cos \theta)$.
10. Solve $(py + x)(px - y) = 2p$.
11. Solve $(D^2 - 3D + 2)y = \cosh x$.
12. Solve $(D^2 - 2D + 1)y = x^2 e^{3x}$.
13. Solve $(D^2 + 1)y = \sec x$ by method of variation of parameters.

	P.R. Government College (Autonomous) KAKINADA	Program & Semester I Major & Minor (II Sem) w.e.f.2023-24 admitted Batch			
Course Code MAT-201P	TITLE OF THE COURSE Differential Equations & Problem Solving Sessions Practical Course				
Teaching	Hours Allocated:30(Practical's)	L	T	P	C
Pre-requisites:	Basic Mathematics Knowledge	-	-	2	1

UNIT – I: Differential Equations of first order and first degree

Linear Differential Equations; Differential equations reducible to linear form; Exact differential equations; Integrating factors, Equations reducible exact equations by integrating factors:

1. Inspection Method 2. $1 / Mx + Ny$ 3. $1 / Mx - Ny$

UNIT – II: Orthogonal Trajectory and Differential Equations of first order but not of the first degree

Differential Equations of first order but not of the first degree :

Equations solvable for p; Equations solvable for y, Equations solvable for x - Clairaut's Equation.
Orthogonal trajectories : Cartesian and polar co- ordinates.

UNIT – III: Higher order linear differential equations

Solution of homogeneous linear differential equations of order n with constant coefficients;
Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators.

P.I. of $f(D)y = Q$ when $Q = e^{ax}$

P.I. of $f(D)y = Q$ when Q is $b \sin ax$ or $b \cos ax$.

UNIT – IV: Higher order linear differential equations (continued)

Solution of the non-homogeneous linear differential equations with constant coefficients. P.I. of $f(D)y = Q$ when $Q = bx^k$

P.I. of $f(D)y = Q$ when $Q = be^{ax}$ V

P.I. of $f(D)y = Q$ when $Q = xV$

UNIT –V: Higher order linear differential equations with non-constant coefficients

Linear differential equations with non-constant coefficients : The Cauchy-Euler Equation ;Legendre's Equations, Method of variation of parameters.

BLUE PRINT FOR PRACTICAL PAPER PATTERN

COURSE-I, DIFFERENTIAL EQUATIONS

Unit	TOPIC	E.Q	Marks allotted to the Unit
I	Differential Equations of first order and first degree	2	12
II	Orthogonal Trajectory and Differential Equations of first order but not of the first degree	2	12
III	Higher order linear differential equations	1	06
IV	Higher order linear differential equations (continued)	2	12
V	Higher order linear differential equations with non-constant coefficients	1	06
Total		08	48

Semester – I End Practical Examinations

Scheme of Valuation for Practical's

Time : 2 Hours

Max. Marks : 50

- **Record** - 10 Marks
- **Viva voce** - 10 Marks
- **Test** - 30 Marks

Answer any 5 questions. At least 2 questions from each section. Each question carries 6 marks.

P.R. GOVT. COLLEGE (AUTONOMOUS), KAKINADA
I year B.Sc., Degree Examinations - II Semester
Mathematics Course-I: Differential Equations
(w.e.f. 2023-24 Admitted Batch)
Practical Model Paper (w.e.f. 2023-2024)

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Time: 2Hrs

Max. Marks:

50M

Answer any 5 questions. At least 2 questions from each section.

5 x 6 = 30 Marks

SECTION - A

1. Solve $\frac{dy}{dx}(x^2y^3 + xy) = 1$

2. Solve $x^2y dx - (x^3 + y^3)dy = 0$.

3. Show that the family of confocal conics $\frac{x^2}{a^2 + \lambda} + \frac{y^2}{b^2 + \lambda} = 1$ is self-orthogonal, where λ

is the Parameter.

4. Solve $2px = 2 \tan y + p^3 \cos^2 y$

SECTION - B

5. Solve $(D^2 - 4D + 3)y = \sin 3x \cos 2x$.

6. Solve $(D^2 - 4D + 4)y = 8x^2 e^{2x} \sin 2x$

7. Solve $(D^4 + 2D^2 + 1)y = x^2 \cos x$

8. Solve $[(1+x)^2 D^2 + (1+x)D + 1]y = 4 \cos \log(1+x)$.

➤ **Record - 10 Marks**

➤ **Viva voce - 10 Marks**