

	P.R.Government College (Autonomous): KAKINADA	Program&Semester IB.Sc. (ISem)			
Course Code MAT-101/1201	TITLE OF THE COURSE Differential Equations				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic Mathematics Knowledge	4	0	-	4

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 (12 Hours)

Linear Differential Equations; Differential equations reducible to linear form; Exact differential equations; Integrating factors.

UNIT – II: Orthogonal Trajectory and Differential Equations of first order but not of the first degree (12 Hours)

Orthogonal Trajectories, Equations solvable for p ; Equations solvable for y ; Equations solvable for x ; Equations of the first degree in x and y – Clairaut's Equation.

UNIT – III: Higher order linear differential equations-I**(12 Hours)**

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. General Solution of $f(D)y=0$. General Solution of $f(D)y=Q$ when Q is a function of x , $\frac{1}{f(D)}$ is expressed as partial fractions.

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

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

UNIT – IV: Higher order linear differential equations-II**(12 Hours)**

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 $Q = e^{ax} V$, where V is a function of x .

P.I. of $f(D)y = Q$ when $Q = x V$, where V is a function of x .

UNIT –V: Higher order linear differential equations-III**(12 Hours)**

Method of variation of parameters; The Cauchy-Euler Equation, Legendre's linear equations.

Co-Curricular Activities:**(15 Hours)**

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

Prescribed 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. A text book of Mathematics for B.A/B.Sc, Vol 1, by N. Krishna Murthy & others, published by S. Chand & Company, New Delhi.
2. Ordinary and Partial Differential Equations by Dr. M.D,Raisinghania, published by S. Chand & Company, New Delhi.
3. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha- Universities Press.
4. Differential Equations -Srinivas Vangala & Madhu Rajesh, published by Spectrum University Press.

Additional Inputs :

Total Differential Equations

CO-POMapping:

(1:Slight[Low];

2:Moderate[Medium];

3:Substantial[High],

'-':NoCorrelation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
C01	3	3	2	3	3	3	1	2	2	3	2	3	2
C02	3	2	3	3	2	3	3	1	3	3	3	2	1
C03	2	3	2	3	2	3	2	2	2	3	2	2	3
C04	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	Differential Equations of first order but not of the first degree	2	2	20
III	Higher order linear differential equations-I	2	2	20
IV	Higher order linear differential equations-II	1	2	16
V	Higher order linear differential equations-III	1	2	16
Total		8	10	92

S.A.Q. = Short answer questions (4 marks)

E.Q = Essay questions (6 marks)

Short answer questions : 5X4= 20M

Essay questions : 5X6=30M

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Total Marks = 50M

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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. 2022-23 Admitted Batch)
Model Paper (w.e.f. 2022-2023)

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Time: 2Hrs 30 min

Max. Marks: 50M

PART - I

Answer any FIVE questions. Each question carries FIVE marks.

5 X 5=25M

1. Solve $(y - e^{\sin^{-1}x}) \frac{dx}{dy} + \sqrt{1-x^2} = 0$
2. Solve $(x^2 + y^2 + 2x)dx + 2y dy = 0$
3. Solve $y + px = p^2x^4$
4. Find the Orthogonal trajectories of family of curves $r = a(1 + \cos\theta)$.
5. Solve $(D^2 - 3D + 2)y = \cos hx$
6. Solve $(D^3 + 2D^2 + D)y = e^{2x}$
7. Solve $(D^2 - 4D + 4)y = x^3$
8. Solve $(x^2D^2 - xD + 1)y = 2 \log x$

PART - II

Answer the following questions. Each question carries SIX marks.

5 X 6=30M

9. Solve $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$
(OR)
10. Solve $\frac{dy}{dx}(x^2y^3 + xy) = 1$
11. Solve $p^2 + 2py \cot x = y^2$
(OR)
12. Find the orthogonal trajectories of the family of curves $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$, where a is the parameter.
13. Solve $(D^2 + a^2)y = \tan ax$.
(OR)
14. Solve $(D^2 - 4D + 3)y = \sin 3x \cos 2x$.
15. Solve $(D^2 - 2D + 4)y = 8(x^2 + e^{2x} + \sin 2x)$
(OR)
16. Solve $(D^2 - 4D + 4)y = 8x^2 e^{2x} \sin 2x$
17. Solve $(D^2 - 2D)y = e^x \sin x$ by the method of variation of parameters.
(OR)
18. Solve $[(1+x)^2 D^2 + (1+x)D + 1]y = 4 \cos \log(1+x)$.

	P.R.Government College (Autonomous) KAKINADA		Program & Semester IB.Sc. (ISem) w.e.f.2022-23 admitted Batch			
Course Code MAT-101P	TITLE OF THE COURSE Differential Equations					
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

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

- Orthogonal Trajectories
- Equations solvable for p
- Equations solvable for y
- Equations solvable for x
- **Equations of the first degree in x and y – Clairaut's Equation**

UNIT – III: Higher order linear differential equations-I

- 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.
- General Solution of $f(D)y=0$
- General Solution of $f(D)y=Q$ when Q is a function of x , $\frac{1}{f(D)}$ is expressed as partial fractions.
- P.I. of $f(D)y = Q$ when $Q = be^{ax}$
- P.I. of $f(D)y = Q$ when Q is $b \sin ax$ or $b \cos ax$.

UNIT – IV: Higher order linear differential equations-

- P.I. of $f(D)y = Q$ when $Q = b x^k$
- P.I. of $f(D)y = Q$ when $Q = e^{ax} V$, where V is a function of x .
- P.I. of $f(D)y = Q$ when $Q = x V$, where V is a function of x .

UNIT –V: Higher order linear differential equations-III

- Method of variation of parameters
- The Cauchy-Euler Equation
- Legendre's linear equations.

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	Differential Equations of first order but not of the first degree	2	12
III	Higher order linear differential equations-I	1	06
IV	Higher order linear differential equations-II	2	12
V	Higher order linear differential equations-III	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 - I Semester
Mathematics Course-I: Differential Equations
(w.e.f. 2022-23 Admitted Batch)
Practical Model Paper (w.e.f. 2022-2023)

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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**