PARVATHANENI BRAHMAYYA
SIDDHARTHA COLLEGE OF ARTS & SCIENCE
Autonomous
Siddhartha Nagar, Vijayawada–520010
Re-accredited at 'A+' by the NAAC

23MAMAL121: Differential Equations

Offered to: B.Sc. Honours (Mathematics) **Course Type: Major 3** (Core -TH)
Year of Introduction: 2023-24 **Year of offering: 2023 - 2024**
Semester: **II** 75 Hrs **Credits: 4**

Course Outcomes: At the end of the course the student will be able to

COURSE CODE	Course Outcome NO	Outcome	Mapping to POs
23MAMAL121	CO1	Determine the solution of differential equations of the first order and of the first degree by Exact, Linear and Bernoulli's method.	PO5
	CO2	Understand the basic concepts of first order differential Equations to find Orthogonal trajectories.	PO5
	CO3	Determine the solution of differential equations of the First order and of a degree higher than first by using methods of solvable for P, X, and Y.	PO6
	CO4	Compute all solutions of second and higher order linear differential equations with constant coefficients, linear Equations with variable coefficients.	PO7
	CO5	Calculate the solutions of higher order differential Equations by Cauchy Euler and Variation of parameters.	PO7

CO-PO MATRIX							
CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1					**3**		
CO2					**3**		
CO3						**2**	
CO4							**2**
CO5							**2**

UNIT-I:DIFFERENTIAL EQUATIONS OFFIRST ORDER & FIRSTDEGREE (15Hrs)

1.1 Linear Differential Equations
1.2 Differential Equations Reducible to Linear Form, Bernoulli's differential equations.

1.3 Exact Differential Equations, Equations reducible to exact form by integrating factors.
1.4 Integrating Factors, Inspection Method, 1/Mx+Ny,1/Mx-Ny

UNIT-II:DIFFERENTIAL EQUATIONS OF FIRST ORDER BUT NOT FIRST DEGREE (15Hrs)

2.1 Equations solvable for P
2.2 Equations solvable for Y
2.3 Equations solvable for X
2.4 Clairaut's Equation
2.5 Orthogonal Trajectories: Cartesian and Polar forms.
2.6 Clairaut's Equation and Equations reducible to clairaut's form.

UNIT – III: Higher order linear differential equations - I (15Hrs)

3.1 Solution of homogeneous linear differential equations of order n with constant coefficients
3.2 Solution of the non-homogeneous linear differential Equations with constant coefficients by means of polynomial operators.
3.3 P.I. of f(D) y =Q when $Q=be^{ax}$
3.4 P.I.of f(D) y= Q when Q is b sinax or b cosax.

UNIT – IV: Higher order linear differential equations-II (15Hrs)

4.1 Solution of the non-homogeneous linear differential equations with constant coefficients.
4.2 P.I.of f(D)y=Q when $Q=bx^k$
4.3 P.I.of f(D)y=Q when $Q=e^{ax}V$, where V is a function of x.
4.4 P.I.of f(D)y=Q when Q=xV, where V is the function of x.

UNIT-V:Higher order Differential Equations with non – constant coefficients (15Hrs)

5.1 Linear differential Equations with non-constant coefficients.
5.2 The Cauchy-Euler Equation.
5.3 Legendre Equation.
5.4 Method of Variation of parameters.

Text Book: A text Book of Mathematics for B.A / B.Sc Vol– I,V.KrishnaMurthy, S-Chand & co, 2015.

Reference Book:

1. A text book of mathematics for B.A/B.ScVol– I, Dr.A.Anjaneyulu, Deepthi Publications 2015.
2. Ordinary & Partial Differential Equations, RaiSinghania, S-Chand & Co, 2009.
3. Differential Equations and their applications, Zafar Ahsan, Prentice-Hall of India Pvt Ltd, 2000.

Student Activities:

1) **Class-room activities :**Power point presentations, Assignments
2) **Libraryactivities:**VisittolibraryandpreparationofnotesforAssignmentproblems.
3) **ActivitiesintheSeminars,workshopsandconferences:**Participation/presentationinseminar/workshop/conference.

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23MAMAL121: DIFFERENTIAL EQUATIONS **SEMESTER – II**
Time: 3hrs. **Max. Marks: 70**

Section –A

Answer the following questions **5x4=20M**

1. (a) Solve $(e^y+1)\cos x\,dx + e^y \sin x\,dy = 0$ (CO1, L2)

(OR)

(b) Solve $x\frac{dy}{dx} + 2y - x^2 \log x = 0$ (CO1, L2)

2. (a) Find the orthogonal trajectories of the family of straight lines in a plane and passing through the origin. (CO2, L4)

(OR)

(b) Solve $p^2 - 5p + 6 = 0$ (CO2, L4)

3. (a) Solve $\left(D^2 - 5D + 6\right)y = e^{4x}$ (CO3, L2)

(OR)

(b) Solve $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = \sin 2x$ (CO3, L2)

4. (a) Solve $(D^2 - 3D + 2)y = 2x^2$ (CO4, L4)

(OR)

(b) Solve $(D^2+4)y = x\sin x$ (CO4, L4)

5. (a) Write the working rules to find a part of C.F of $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = 0$ by inspection. (CO5, L2)

(OR)

(b) Find the C.F of $(D^2+1)y = \cos ec\, x$ (CO5, L2)

Section –B

Answer the following questions **5 x 10 = 50M**

6. (a) Solve $x^2 y dx - (x^3 + y^3)dy = 0$ (CO1, L2)

(OR)

(b) Solve $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$ (CO1, L2)

7. (a) 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

a parameter. (CO2, L4)

(OR)

(b) Solve $p^2 + 2py\cot x = y^2$ (CO2, L4)

8. (a) Solve $(D^2 - 3D + 2)y = \cosh x$ (CO3, L2)

(OR)

(b) Solve $(D^2 - 4D + 3)y = \sin 3x \cos 2x$ (CO3, L2)

9. (a) Solve $(D^2 - 2D + 4)y = 8(x^2 + e^{2x} + \sin 2x)$ (CO4, L4)

(OR)

(b) Solve $(D^2 - 4D + 1)y = e^{2x}\cos^2 x$ (CO4, L4)

10 (a) Solve $(D^2 + a^2)y = \tan ax$ by the method of variation of parameters. (CO5, L2)

(OR)

(b) Solve $x^3\frac{d^3y}{dx^3} + 2x^2\frac{d^2y}{dx^2} + 2y = 10\left(x + \frac{1}{x}\right)$ (CO5, L2)

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