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

23MAMI121: Differential Equations

Offered to: **ALL UG PROGRAMMS** **Course Type: Minor 1** (Core -TH)

Year of Introduction: 2023-24 **Year of offering: 2023 - 2024**

Semester: **II** 75 Hrs **Credits: 4**

Course Outcomes:

S.No	At the end of the course the student will be able to Upon successful completion of this course, students should have the knowledge and skills to:	MAPPING
1	Determine the solution of differential equations of the first order and of the first degree by Exact, Linear and Bernoulli's method.	PO7
2	Understand the basic concepts of first order differential Equations to find Orthogonal trajectories.	PO6
3	Determine the solution of differential equations of the firstorderandofadegreehigherthanfirstbyusingmethodsofsolvablefor P, X and Y.	PO7
4	Compute all solutions of second and higher order linear differential equations with constant co efficient, linear Equations with variable coefficients.	PO1
5	Calculate the solutions of higher order differential Equations by Cauchy Euler and Variation of parameters.	PO6

CO-PO MATRIX							
CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1							**2**
CO2						**1**	
CO3							**3**
CO4	**2**						
CO5						**2**	

UNIT-I: DIFFERENTIALEQUATIONS OF FIRST 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 FIRSTORDERBUTNOTFIRSTDEGREE (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: Higherorderlineardifferentialequations - 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: Higherorderlineardifferentialequations-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:HigherorderDifferentialEquationswith 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.

Student Activities:

1. **Class-roomactivities:**Powerpointpresentations,Assignments
2. **Libraryactivities:**VisittolibraryandpreparationofnotesforAssignmentproblems.
3. **ActivitiesintheSeminars,workshopsandconferences:**Participation/presentationinseminar/workshop/conference.

TEXT BOOKS:

1.A text book of Mathematics for B.A/B.Sc Vol – I, Author V Krishna Murthy, S – Chand & Co 2015.

REFERENCE BOOKS:

1. A text book of Mathematics for B.A/B.Sc Vol – I, Author Dr.A.Anjaneyulu, Deepthi Publications 2015.
2. A text book of Ordinary & Partial D.E for B.A/B.Sc Vol – I, Author Rai Singania S-Chand & Co 2015.
3. A Text Book of Differential Equations and their applications, Zafar Ahsan, Prentice-Hall of India Pvt Ltd, 2000.

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23MAMIL121: DIFFERENTIAL EQUATIONS

SEMESTER – II **Time: 3hrs.**

Max. Marks: 70

MODEL QUESTION PAPER

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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