Gyanmanjari
Innovative University

Subject: Differential Equation (BSCMA12306)

Type of course: Minor

Prerequisite: Detail of Differential Equation.

Rationale: Differential equations are a fundamental tool in mathematics and the sciences, serving as a powerful means to model and describe natural phenomena. The rationale behind using differential equations is rooted in their ability to express relationships between variables that change continuously.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks			Total Marks
				SEE	CCE		
CI	T	P	C	Theory	MSE	ALA	
4	0	0	4	100	30	70	200

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; MSE- Mid Semester Examination; LWA - Lab Work Assessment; V – Viva voce; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.

CourseContent:

Unit No.	Course content	Hrs.	% Weightage
1.	**Chapter -1:** ➤ Introduction of Ordinary differential equation ➤ Order and degree of differential equation and its types ➤ Variable separable equation. ➤ Homogeneous differential equation and Non- homogeneous differential equations. ➤ Differential equations of first order and first degree and it's solution. ➤ Solutions of linear differential equations of first order and first degree.	15	25

2.	**Chapter - 2:** ➢ Definition and method of solving ofBernoulli's differential equation ➢ Definition and method of solving ofExactdifferential equation. ➢ Differential equations of first order and higher degree solvable for x, solvable for y, solvable for p. ➢ Clairaut's form of differential equation and Lagrange's form of differential equations.	15	25
3.	**Chapter – 3:** ➢ Introduction of Linear differential equations ofhigher order ➢ Linear differential equations of higher order with constant coefficients. ➢ Operator D and 1/D, Meaning of auxiliary equation, ➢ Roots of auxiliary equation and solution of auxiliary equation $f(D)y = 0$ for real roots and complex roots ➢ Solution of differential equations of the type $f(D)y = X$.	15	25
4.	**Chapter – 4:** ➢ Meaning of Complimentary Function (C.F.) and Particular Integral (P.I.) ➢ Methods to obtain Particular integral(P.I.) when $X = e^{ax}$, $X = \sin(ax+b)$, $X = \cos(ax+b)$, $X = x^m$, $X = e^{ax}.V$ ➢ Linear differential equations with variable coefficients. Their applications: ➢ Equation reducible to with constant coefficients. ➢ Second order linear differential equations	15	25

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1.	**Presentation:** Faculty will assign topics and students will prepare Presentations (Slideshow/video) and upload them to GMIU web portal.	10
2.	**Puzzle :** Various problems based on differential equationwill be assigned to the students. Students need to submit Mathematical logic and Solution via GMIU web portal	10
3.	**Problem Solving:** Faculty will Provide a problem definition that students have to prepare a chart form in hard copy and upload it to GMIU web portal.	10
4.	**Test of Formulas:** Students have to list out formulas with example used in given chapter and upload it to GMIU web portal.(Minimum 10 formulas).	10
5.	**Chart:** Chart upon application of any topic of syllabus must be prepared by the students and upload to GMIU web portal.	10

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6.	**Short Tricks by Using Vedic Maths:** Students will prepare chart on shortcut trick of Operation of Maths like multiplication , Square root , square , Factor ,etc. and upload to GMIU web portal.	10
7.	**GeoGebra an interactive math tool:** Solve Mathematical problems given by teacher with graphical visualization using GeoGebra open source interactive math tool and submit the solutions to the GMIU web portal.	10
	Total	70

Suggested Specification table with Marks (Theory): 100

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20	40	30	10	-	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course the students should be able to: ·	
CO1	Understand the order, degree, and types of differential equations.
CO2	Remember and solve Bernoulli's and exact differential equations, explore first-order solvable equations, and recognize Clairaut's and Lagrange's forms.
CO3	Analyze linear differential equations of higher order with constant coefficients.
CO4	Apply different approaches for solving differential equations.

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory.

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

[1] B.Rai, H.I. Freedman & others: A Course in Ordinary Differential Equations, Narosa Publishing House, Daryaganj, New Delhi (2002)

[2] E.A.Coddington&N.Levinson: Ordinary Differential Equations. McGraw-Hill.

[3] S.G.Deo, V.Raghavendra, &others: A Text book of Ordinary Differential Equations, Tata- McGraw Hill.

[4] Differential Equations Publish by Ekta prakashan.

[5] Differential Equations Publish by Nirav prakashan.

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