

### Differential Equations and Vector Calculus

<b>Course Code</b>	23BS1201	<b>Year</b>	I	<b>Semester</b>	II
<b>Course Category</b>	Basic Science	<b>Branch</b>	ECE	<b>Course Type</b>	Theory
<b>Credits</b>	3	<b>L-T-P</b>	3-0-0	<b>Pre- requisites</b>	NIL
<b>Continuous Internal Evaluation:</b>	30	<b>Semester End Evaluation:</b>	70	<b>Total Marks:</b>	100

#### Course Outcomes

Upon successful completion of the course, the student will be able to

<b>CO1</b>	Interpret the basic concepts of differential equations and vector calculus L2
<b>CO2</b>	Apply different methods to solve ordinary differential equations and partial differential equations, L-C-R Circuit problems and simple harmonic motion problems L3
<b>CO3</b>	Apply the differential operator to calculate the divergence and flux of vector point functions L3
<b>CO4</b>	Analyse the given ordinary differential equation and partial differential equation to find the solution L4
<b>CO5</b>	Evaluate work done; flux using line and surface integrals, areas and volumes using vector integral theorems L4
<b>CO6</b>	Submit a report by solving the given problems using the concepts of Differential equations and Vector Calculus.

#### Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3: High, 2: Medium, 1: Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
<b>CO1</b>	2												1	
<b>CO2</b>	3												1	
<b>CO3</b>	3												1	
<b>CO4</b>		3											1	
<b>CO5</b>		3											1	
<b>CO6</b>									3	3		3	1	

#### Syllabus

<b>Unit No.</b>	<b>Contents</b>	<b>Mapped CO</b>
I	<b>Differential equations of first order and first degree</b> Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay-Electrical circuits.	CO1,2,4,6

II	<b>Linear differential equations of higher order (Constant Coefficients)</b> Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.	CO1,2,4,6
III	<b>Partial Differential Equations</b> Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.	CO1,2,4,6
IV	<b>Vector differentiation</b> Scalar and vector point functions, vector operator Del, Del applies to scalar point functions- Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.	CO1,3,5,6
V	<b>Vector integration</b> Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.	CO1,3,5,6

### Learning Resources

#### Text Books

1. Higher Engineering Mathematics, B.S.Grewal, Khanna Publishers, 2017, 44<sup>th</sup> Ed.
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10<sup>th</sup> Ed.

#### Reference Books

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14<sup>th</sup> Ed.
2. Dennis G. Zill and Warren S. Wright, Jones and Bartlett, Advanced Engineering Mathematics, 2018.
3. Glyn James, Advanced Modern Engineering Mathematics, Pearson publishers, 2018, 5<sup>th</sup> Ed.
4. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Alpha Science International Ltd., 2021 5<sup>th</sup> Ed.
5. Higher Engineering Mathematics, B.V.Ramana, Mc Graw Hill Education, 2017

#### e-Resources

1. <https://nptel.ac.in/courses/111/105/111105121/>
2. <https://nptel.ac.in/courses/111/105/111105122/>
3. <https://nptel.ac.in/courses/111/107/111107108/>