

## Course Information Sheet

<b>Programme:</b> UG	<b>Degree:</b> B.Tech (Common for all Branches)	
<b>Course Code:</b>	<b>Course Title:</b> Differential Equations and Vector Calculus	
<b>Year:</b> I Sem: II <b>A.Y. :</b> 2025-26	<b>Regulation:</b> IS23 <b>College:</b> ISTS (an Autonomous Institution)	
<b>L T/P/D C:</b> 3/0/0/3	<b>Credits:</b> 3	<b>Contact Hrs:</b> 5
<b>Mid Marks:</b> 30	<b>External Marks:</b> 70	<b>Total Marks:</b> 100
<b>Teaching Hrs:</b>	<b>Exam Duration:</b> 3 hrs.	

### Course Information:

Course Code	Course Name	Description	Year-Sem
	Differential equations and vector calculus	<ul style="list-style-type: none"> <li>To bridge the gap between the mathematics in school at 10+2 level and UG level engineering courses by identifying the importance of Differentiation and Integration in daily life.</li> <li>Application of row and column operations in finding the rank of a matrix useful in computer programming.</li> </ul>	I B.Tech (Common to all branches)

**Course outcomes:**

Student will able to

<b>SUBJECT : DEVC</b>		
<b>CO.NO</b>	<b>Course Outcomes</b>	<b>BT Level</b>
After successful completion of this course students will be able to:		
<b>C112.1</b>	CO1: Solve the differential equations related to various engineering fields	Evaluation
<b>C112.2</b>	CO2:Use different methods to solve ordinary differential equations and partial differential equations, L-C-R Circuit problems	Applying
<b>C112.3</b>	CO3:Use different methods to solve partial differential equations and their applications	Understanding
<b>C112.4</b>	CO4: Apply differential operators to calculate the divergence and flux of vector point functions.	Applying
<b>C112.5</b>	CO5: Use the given data to find work done, flux using line and surface integrals, areas and volumes using vector integral theorems	Analyzing

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO) and Program Specific Outcomes (PSO's):**

Course Outcomes (CO)	Program Outcomes (PO)												Program Specific Outcomes (PSO's)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
C112.1	2		-	--	-	-	-	-	-	-	-	-	-	-
C112.2	3		-	-	-	-	-	-	-	-	-	-	-	-
C112.3	3		-	-	-	-	-	-	-	-	-	-	-	-
C112.4		3	-	-	-	-	-	-	1	1	-	-	-	-
C112.5		3	-	-	-	-	-	-	1	1	-	-	-	-

**Level:** 3–Strongly linked | 2–Moderately linked | 1–Weakly linked

## JUSTIFICATIONS OF CO –PO MAPPING

C121.1		
C112.1-P01	2	Explained the need of differential equations in different branches of engineering mainly in Electrical and Electronics engineering.
C112.1-P02	--	
C112.1-P04	--	
C112.1-P05	---	
C112.1-P06	--	
C112.1-P07	--	
C112.1-P08	--	
C112.1-P09	--	
C112.1-P010	--	
C112.1-P011	--	
C112.1-P012	--	

C112.2		
C112.2-P01		
C112.2-P02	3	Understand the basic concepts of Higher order D.E
C112.2-P03	3	Explain the various methods of solving PDE
C112.2-P04	--	
C112.2-P05	--	
C112.2-P06	--	
C112.2-P07	--	
C112.2-P08	--	
C112.2-P09	--	
C112.2-P010	--	
C112.2-P011	--	
C112.2-P012	--	

## C112.3

C112.3-P01	--	
C112.3-P02	--	
C112.3-P03	--	
C112.3-P04	--	
C112.3-P05	--	
C112.3-P06	--	
C112.3-P07	--	
C112.3-P08	--	
C112.3-P09	--	
C112.3-P010	--	
C112.3-P011	--	
C112.3-P012	--	

C112.4		
C112.4-P01	--	
C112.4-P02	2	Summarize various types of differential operators and their applications.
C112.4-P03	2	Classify the vectors depending on the divergence and curl with the applications in engineering.
C112.4-P04	--	
C112.4-P05	--	
C112.4-P06	--	
C112.4-P07	--	
C112.4-P08	--	
C112.4-P09	1	Completing the situations of applications of the operators in different branches of engineering.
C112.4-P010	1	Completing the situations of applications of the Integrals in different branches of engineering
C112.4-P011	--	
C112.4-P012	--	

C112.5		
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C112.5-P02	--	
C112.5-P03	--	
C112.5-P04	--	
C112.5-P05	--	
C112.5-P06	--	
C112.5-P07	--	
C112.5-P08	--	
C112.5-P09	1	Applications of Line integrals and surface integrals in various fields.
C112.5-P010	1	Summarize the applications in Gauss divergence theorem and Green's theorem
C112.5-P011	--	
C112.5-P012	--	

**Justification for Avg CO-PO Mapping**

<b>Mapping</b>	<b>Level</b>	<b>Justification</b>
C112.PO1	3.0	In Engineering tools, knowledge the differential operators and vector fields
C112.PO2	2.3	In modern technology, Impart Knowledge of different types of vector integrals .
C112.PO3	---	
C112.PO4	--	
C112.PO5	---	
C112.PO6	--	
C112.PO7	--	
C112.PO8	--	
C112.PO9	--	
C112.PO10	--	
C112.PO11	--	
C112.PO12	--	

### Justification for CO-PSO Mapping

Mapping	Level	Justification
C112.PO1	--	
C112.PO2	--	
C112.PO3	--	
C112.PO4	--	
C112.PO5	--	
C112.PO6	--	
C112.PO7	--	
C112.PO8	--	
C112.PO9	--	
C112.PO10	--	
C112.PO11	--	
C112.PO12	--	

### Topics beyond Syllabus

S.No.	Description	Proposed Actions
1	Applications of Differential equations in Newton's laws of cooling and other areas	Assignments
2	Applications of Integrals in Vector integral theorems.	Assignments

### TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/PROJECTS/NPTEL ETC

#### Topic beyond Syllabus: Mapping with PO and PSO:

Topic beyond syllabus	Program Outcomes (PO)												Program Specific Outcomes (PSO's)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1.	3	3				-	-	-	-	-	-	-	-	-

#### Justification for Topic beyond the Syllabus (TBS) -PO Mapping.

**WEB SOURCE REFERENCES:**

<b>1</b>	1. <a href="https://nptel.ac.in/courses/111/105/111105121/">https://nptel.ac.in/courses/111/105/111105121/</a> 2. <a href="https://nptel.ac.in/courses/111/105/111105122/">https://nptel.ac.in/courses/111/105/111105122/</a> 3. <a href="https://nptel.ac.in/courses/111/107/111107108/">https://nptel.ac.in/courses/111/107/111107108/</a>
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**Syllabus / Lesson Plan:**

Sl.No	Unit	Topic	No. of Periods	Text Book / Reference Book	Teaching Aid Used / Methodology	Hours
<b>Differential equations of first order and first degree</b>						
1	<b>1</b>	Introduction	1	RB.1	CHALK/TALK	<b>10</b>
2		Linear differential equations	1	RB.1	CHALK/TALK	
3		Bernoulli's Differential Equations	1	RB.1	CHALK/TALK	
4		Exact equations	1	RB.1	CHALK/TALK	
5		Equations reducible to exact form	1	RB.1	PPT	
6		Applications: Law of natural growth and decay	1	RB.1	CHALK/TALK	
7		Newton's law of cooling	1	RB.1	CHALK/TALK	
8		Applications to Electrical Circuits-Problems	3	----		
<b>Linear differential equations of higher order (Constant Coefficients)</b>						
9	<b>2</b>	Definitions: Homogeneous and Non Homogeneous equations	1	RB.2	CHALK/TALK	<b>9</b>
10		Complementary function, particular integral	1	RB.2	CHALK/TALK	
11		General solution	1	RB.2	CHALK/TALK	
12		Applications of D.E: Method of variation of parameters.	1	RB.2	CHALK/TALK	
13		Applications to L-C-R Circuit	1	RB.2	CHALK/TALK	
14		More Applications of D.E	1	RB.2	CHALK/TALK	
15		Problems	3	----		
<b>Partial Differential Equations</b>						
16	<b>3</b>	Introduction-Types of PDE	1	RB.1	CHALK/TALK	
17		Formation of Partial Differential Equations-Introduction	1	RB.1	CHALK/TALK	
18		Elimination of arbitrary constants for forming PDE	1	R.B.1	CHALK/TALK	
19		Formation of Partial Differential	1	RB.1	CHALK/TALK	

		Equations by elimination of arbitrary functions				<b>15</b>
<b>20</b>		Solutions of First order linear equations by Lagrange's Method	<b>1</b>	RB.1	CHALK/TALK	
<b>21</b>		Method of Grouping	<b>1</b>	RB.1	CHALK/TALK	
<b>22</b>		Method of Multipliers	<b>1</b>	RB.1	CHALK/TALK	
<b>23</b>		Problems on Lagrange's method	<b>1</b>	RB.1	CHALK/TALK	
<b>24</b>		Different cases of Lagrange's Method	<b>1</b>	RB.1	CHALK/TALK	
<b>25</b>		Homogeneous Linear PDE with constant coefficients	<b>1</b>	RB.1	CHALK/TALK	
<b>26</b>		Solving the equations by finding the C.F	<b>1</b>	RB.1	CHALK/TALK	
<b>27</b>		Non homogeneous PDE solution	<b>1</b>	RB.1	CHALK/TALK	
<b>28</b>		Finding the Particular solution	<b>1</b>	RB.1	CHALK/TALK	
<b>29</b>		General solution of a PDE	<b>1</b>	RB.1	CHALK/TALK	
<b>30</b>		Problems	<b>1</b>	-----		
<b>Vector Differentiation</b>						
<b>30</b>		Introduction	<b>1</b>	TB.1	CHALK/TALK	<b>13</b>
<b>31</b>		Scalar and vector point functions	<b>1</b>	TB.1	CHALK/TALK	
<b>32</b>		Vector Differential operator Del	<b>1</b>	TB.1	CHALK/TALK	
<b>33</b>		Del applies to scalar point function and applications	<b>1</b>	TB.1	CHALK/TALK	
<b>34</b>		Gradient and applications	<b>1</b>	TB.1	CHALK/TALK	
<b>35</b>		Scalar potential function	<b>1</b>	TB.1	CHALK/TALK	
<b>36</b>		Properties of curl and gradient	<b>1</b>	TB.1	CHALK/TALK	
<b>37</b>		Directional derivative and applications	<b>1</b>	TB.1	CHALK/TALK	
<b>38</b>		Del applied to vector point functions	<b>1</b>	TB.1	CHALK/TALK	
<b>39</b>		Divergence and Curl applications	<b>1</b>	TB.1	CHALK/TALK	
<b>40</b>		Problems	<b>3</b>			
<b>Vector Integration</b>						
<b>41</b>	<b>5</b>	Introduction	<b>1</b>	TB.1	CHALK/TALK	<b>13</b>
<b>42</b>		Line integral evaluation	<b>1</b>	TB.1	CHALK/TALK	
<b>43</b>		Line integral-circulation	<b>1</b>	TB.1	CHALK/TALK	
<b>44</b>		Applications-work done	<b>1</b>	TB.1	CHALK/TALK	
<b>45</b>		Surface integral-evaluation	<b>1</b>	TB.1	CHALK/TALK	
<b>46</b>		Volume integral evaluation	<b>1</b>	TB.1	CHALK/TALK	
<b>47</b>		Applications on the integrals	<b>1</b>	TB.1	CHALK/TALK	
<b>48</b>		Gauss's Div Theorem (without proof)	<b>1</b>	TB.1	CHALK/TALK	
<b>49</b>		Green's theorem	<b>1</b>	TB.1	CHALK/TALK	
<b>50</b>		Stoke's theorem	<b>1</b>	TB.1	CHALK/TALK	
<b>51</b>		Problems	<b>3</b>			

**Topic Beyond Syllabus:**

S.No.	Topic Beyond Syllabus Planning	PERIODS	Methodology	Text book/references/web references and additional text book reference
1	Applications of Differential equations	2	Assignment	T1,R3
2	Vector Integration Theorems	2	Assignment	

**Note: Bloom's Taxonomy Levels**

<b>BTL1-Remember</b>	<b>BTL2 – Understand</b>	<b>BTL3 –Apply</b>
<b>BTL4-Analyze</b>	<b>BTL5 –Evaluate</b>	<b>BTL6–Create</b>

**Text books (T) / Reference books (R)/Additional text books (A):**

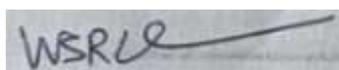
T/R/A	Book Title/Author/Publication
<b>T1</b>	Higher Engineering Mathematics, B.S.Grewal, Khanna Publishers, 2017, 44th Edition.
<b>T2</b>	Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition
<b>R1</b>	Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
<b>R2</b>	Advanced Engineering Mathematics, R.K.Jain and S.R.K.Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
<b>R3</b>	Higher Engineering Mathematics, B.V.Ramana, Mc Graw Hill Education, 2017

### ASSESSMENT METHODOLOGIES-DIRECT

<input checked="" type="checkbox"/> ASSIGNMENTS	<input checked="" type="checkbox"/> STUD. SEMINARS	<input checked="" type="checkbox"/> TESTS/MODEL EXAMS	<input checked="" type="checkbox"/> UNIV. EXAMINATION
<input type="checkbox"/> STUD. LAB PRACTICES	<input type="checkbox"/> STUD. VIVA	<input type="checkbox"/> MINI/MAJOR PROJECTS	<input type="checkbox"/> CERTIFICATIONS
<input type="checkbox"/> ADD-ON COURSES	<input type="checkbox"/> OTHERS		

### ASSESSMENT METHODOLOGIES-INDIRECT

<input checked="" type="checkbox"/> ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	<input checked="" type="checkbox"/> STUDENT FEEDBACK ON FACULTY (TWICE)
<input type="checkbox"/> ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	<input type="checkbox"/> OTHERS



**Prepared by**



**Approved by**