



SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

26 YEARS

DEPARTMENT OF
ELECTRICAL AND ELECTRONICS ENGINEERING

ELECTRIC VEHICLE CLUB REPORT

(Academic Year: 2025 to 2026)



Submitted by
Mr.B.Parthiban
Assistant Professor
Club Coordinator



Preface

The EV Club of the Department of Electrical and Electronics Engineering at Sri Manakula Vinayagar Engineering College serves as a progressive technical platform dedicated to fostering awareness, innovation, and research-oriented learning in the field of sustainable mobility and emerging transportation technologies. The club provides a structured environment where students gain a comprehensive understanding of modern energy-efficient systems, sustainable engineering practices, and evolving mobility solutions through systematic technical engagement and collaborative learning. Guided by faculty coordinators and actively supported by student members, the club organizes expert talks, technical discussions, design challenges, workshops, project-based learning activities, and industry interaction sessions to bridge the gap between academic knowledge and real-world applications. It encourages analytical thinking, system-level understanding, design optimization approaches, and innovation-driven project development, thereby strengthening students' technical competence and problem-solving abilities. By promoting teamwork, leadership qualities, research orientation, and professional ethics, the EV Club plays a vital role in preparing students to contribute effectively to the advancement of sustainable technologies and to meet the growing demands of the modern engineering landscape with responsibility and technical excellence.

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ABOUT THE INSTITUTION

Sri Manakula Vinayaga Educational Trust was founded to provide quality and affordable education to the weaker sections of society. The trust established Sri Manakula Vinayagar Engineering College (SMVEC) in 1999. SMVEC is an autonomous institution affiliated to Pondicherry University. It offers 13 undergraduate, 8 postgraduate and 11 Research programme in engineering. SMVEC has been accredited by NAAC with “A” grade and NBA. The institution is also accredited by TATA consultancy services. The college has a good placement record with students getting job offers from top companies in India and abroad. SMVEC students have won many awards and accolades for their academic achievements.

Vision

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society.

Mission

M1: Quality Education : To provide comprehensive academic system that amalgamates the cutting edge technologies with best practices.

M2: Research and Innovation : To foster value-based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.

M3: Employability and Entrepreneurship : To inculcate the employability and entrepreneurial skills through value and skill based training.

M4: Ethical Values : To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society.

DEPARTMENT VISION AND MISSION

Vision

To promote proficiency in the field of Electrical and Electronics Engineering by creating a stimulating environment for research, innovation and entrepreneurship

Mission

M1: Quality Education:

To impart high quality technical education with problem solving capabilities by innovative pedagogy in emerging technologies.

M2: Industrial and Societal Needs:

To cater the dynamic needs of the industry and society by strengthening industry-institute interaction.

M3: Research and Innovation:

To nurture the spirit of research attitude by carrying out innovative technologies pragmatically.

M4: Placement and Entrepreneurship:

To inculcate the professionalism in career by advancing synergetic skills to compete in the corporate world.



"Commanding circuits. Controlling motion. Creating change."

ABOUT ELECTRIC VEHICLE CLUB

Electric Vehicles club serves as a place of community for students to discuss, learn, and working on projects related to Electric Vehicles. Members of the Electric Vehicles club are offered with a range of programs and activities such as seminars, project competitions and exposition. The club is supported the students in strategizing and organising activities that will help them knowledge and skills in Electric Vehicles. The clubs aims to guide students and prepare them to pursue their professional careers in industries specialising in Electric Vehicles.

Objectives and Functions of Electric Vehicle Club

- To develop basic understanding of Electric Vehicles.
- To develop basic understanding of electric motors, battery technology.
- To aid in enhancing management skills by organizing events and working in teams.
- To give students hands-on learning experience in the field of electric vehicle and battery management system.
- To aid students to build proto-types of electric vehicles
- To conduct technical programmes such as training, workshops, internships, and expert talks in relevant areas.
- Provide detail budgeting for making electric vehicle proto-types.
- Model components or modules of electric vehicles using appropriate software
- Take part in electric vehicle competitions.
- The EV club can organize awareness campaigns, workshops, and presentations to introduce and educate the college community about electric vehicles. These initiatives can cover topics such as EV technology, benefits, charging infrastructure, government incentives, and the role of EVs in combating climate change.
- The EV club can organize educational workshops and seminars on campus to deepen the understanding of EV technology, charging infrastructure, and related topics.
- The EV club can foster collaboration and networking among students, faculty and industry professionals interested in electric vehicles.



OFFICE BEARERS AND STUDENT MEMBERS

S.No	Name	Position
1.	Mr.B.Parthiban Assistant Professor / EEE	Faculty Coordinators
2.	Mr.S.Mugunthan Assistant Professor / EEE	
3.	Gokul	President
4.	DharaniKumar	Vice President
5.	Gaushik	Secretary
6.	Shreekanth	Treasurer
7.	Malaravan	Joint Secretary
8.	Jaiadithiyan	
9.	Kiruthik	Joint Treasurer
10.	Mathiyarasan	
11.	Neeraja	Executive Members
12.	Baranidharan	
13.	Ashok kumar	
14.	Ayishu	Technical Member



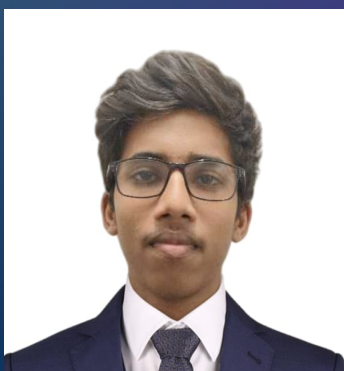
Mr.B.Parthiban
Assistant Professor
Faculty Coordinator



Gokul
President



DharaniKumar
Vice President



Gaushik
Secretary



Malaravan
Joint Secretary



Kiruthik
Joint treasurer

S.NO	NAME OF THE STUDENT	YEAR
1	Gokularamanane S	IV
2	Hemachandasnam S	IV
3	Dhiviya S	IV
4	Gopika J	IV
5	Abhinayaa M	IV
6	Arokia anandu prasanthu A	IV
7	Arunpradaap S	IV
8	Aswinkumar A	IV
9	D.Naveenkumar	IV
10	Arunaish.R	IV
11	Saileshwar.T	IV
12	Nathesh.N.B	IV
13	Mohamed Harun Rasheed.S	IV
14	Vishva P	IV
15	Harinee	IV
16	Iyyappan	IV
17	Ramesh Kumar. P	IV
18	Ragul A	IV
19	Mohamed Abdul Kalam.K	IV
20	Herwin	IV
21	Karmukilan. A	IV
22	S. Ramya	IV
23	A. Balakumaran	IV
24	M.Sivapothiskalicharan	IV
25	Callis Joseph. E	IV
26	Mohamad Kaseem M	IV
27	Thogesh.M	IV
28	P.Gopikrishnan	IV
29	Srilogeshwaran S	IV
30	Mukesh Kumar R	IV
31	Thiruvengadam P	IV
32	Karthikraja S	IV
33	Gunanidhi R	III
34	Hariharaan S	III
35	Hitesh S	III
36	Isreya B	III
37	Iyyanar D	III
38	Iyyapadass R	III
39	Jaiadithyan V	III
40	Kamesh V	III
41	Durga J	III
42	Ganesh S	III
43	Gautham S	III
44	Gokul S	III
45	Gokuladharshini Z	III
46	Karthika S	III
47	kovarthanan E	II
48	leena shree T	II
49	logeshwar S	II
50	Madhavan S	II
51	Manju E	II
52	Meesala Praveen	II

53	Midhun L	II
54	Sanjay R	II
55	Mangaiyarkarasi S	I
56	Mounesh U	I
57	Mukesh S	I
58	Naveena K	I
59	Nithish R	I
60	Priyan B	I
61	Ranjini B	I

EV Saksham – Hands-on Training to Build Electric Vehicles Empowering Future Engineers in Electric Mobility

EV Saksham is a comprehensive skill development initiative designed to provide students with practical exposure to Electric Vehicle (EV) technologies through experiential learning and industry-oriented training. The program focuses on equipping participants with the knowledge and technical competencies required to understand, design, assemble, and maintain electric vehicles.

As the global automotive industry rapidly transitions toward sustainable and clean transportation solutions, EV Saksham serves as a platform for aspiring engineers to gain hands-on experience in emerging EV technologies and prepare themselves for future career opportunities in the electric mobility sector.

Learning Outcomes

Participants gain practical knowledge and skills to:

- Understand the fundamentals and working principles of Electric Vehicles.
- Identify and analyze major EV components and subsystems.
- Assemble and integrate electric vehicle systems.
- Perform basic diagnostics and troubleshooting.
- Apply safety standards in EV design and operation.
- Explore innovation and entrepreneurship opportunities in the EV ecosystem.



The Research and Development Cell of SMVEC proudly organized the inauguration of **EV Saksham** – Hands-on Training to Build Electric Vehicles on 2nd February 2026.

The program marked a significant step towards empowering students with practical knowledge and technical expertise in the rapidly evolving field of Electric Vehicles (EVs).



The dignitaries were formally honoured as a mark of respect and appreciation for their valuable presence and contribution to the institution.

Live Workshop Session-

Following the inauguration ceremony, the students actively attended the live session of the EV Saksham workshop conducted by the resource persons. During this session, participants were introduced to the fundamentals of Electric Vehicle systems and the key components involved in EV development. The experts explained the workflow of building an electric vehicle and provided an overview of the hands-on activities planned for the upcoming days. The session offered students valuable insights into practical EV technologies and prepared them for the intensive hands-on training that followed.



EV Saksham
Batch-I Name list

Date of the Event: 02.02.2026 to 06.02.2026

Timing: 9.00am to 4.50pm

S.No	Name of the Student	Year	Batch
1.	Priyanka.J	III	I
2.	Sivaraj	III	I
3.	Balaji A	III	I
4.	Chathanya S	III	I
5.	Kishore Kumar	III	I
6.	Kavyaa.K	III	I
7.	Elanchezhian. S	III	I
8.	A.Angalan	III	I
9.	Fahim Ahmad F	III	I
10.	Thamizharasu .E	III	I
11.	Dhanuja S	III	I
12.	Rangasamy	II	I
13.	Kamesh	III	I
14.	N.Divyadharshini	III	I

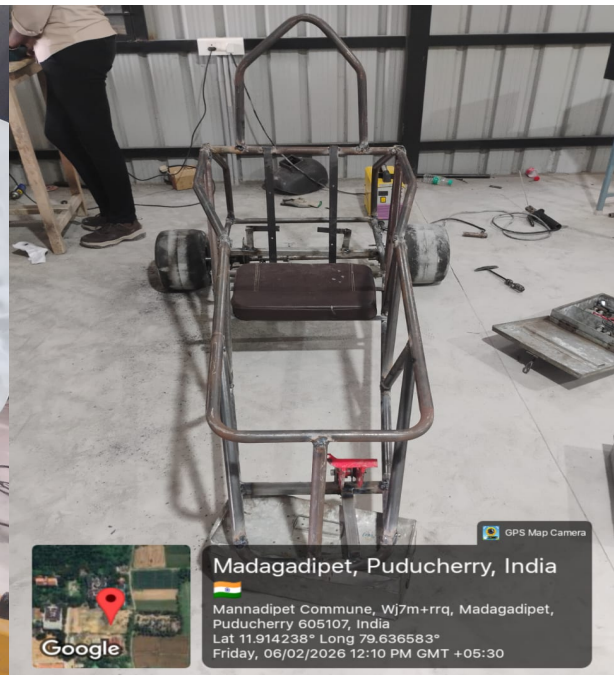
Date of the Event: 09.02.2026 to 13.02.2026

Timing: 9.00am to 4.50pm

S.No	Name of the Student	Year	Batch
1.	Mukundan Suresh	II	II
2.	A Ravivarma	II	II
3.	Bhadrinath B	II	II
4.	K.Poorna Prakash	II	II
5.	Sanjay.R	II	II
6.	Vishva.M	II	II
7.	Abdul Anees	II	II
8.	J.S.Srishanth	II	II
9.	Divakar.S	II	II
10.	Logeshwar S	II	II
11.	Kausik Prabanjan.V	II	II

12.	J.Jayavarshini	II	II
13.	M.R.Prem Kumar	II	II
14.	Midhun L	II	II
15.	Vijayan K	II	II
16.	Nithish.S	II	II

Live Workshop Session



Live Workshop Session



ELECTRICAL VEHICLE - CENTRE OF EXCELLENCE

Sri Manakula Vinayagar Engineering college and TVS Training & Services signed a Memorandum of Understanding (MoU) to establish a Centre of excellence in Electric Vehicle. The centre of Excellence laboratory will be set up at the SMVEC campus and training will be provided by TVS Training & Services.

The MoU was signed by Dr.V.S.K.Venkatachalapathy, Director cum Principal, Sri Manakula Vinayagar Engineering college, and Mr. Mohammed Samiuddin, Deputy General Manager, TVS - Training & Services on 28.3.2024.

This centre of Excellence will be equipped with state-of-the-art facilities to provide a conducive environment for research and is expected to make a valuable contribution to the development of electrical vehicle technology. It will serve as a hub for research, innovation, and collaboration in electric vehicle cutting-edge technology.

Also, it will provide a platform for the exchange of knowledge and idea to facilitate the development of skills and expertise in this field. TVS - Training & Services will take care of Training, Assessment and placement support.

Shri. M. Dhanasekaran, Chairman and Managing Director SMV trust, Dr. K. Narayanaswamy, Secretary, Shri. D. Rajarajan, Treasurer, Controller of Examinations, Dean Academics, Dean Research and Development, Dean Placement, Deans of various schools, Heads of various departments had participated in this MoU signing event.



MoU for Electrical Vehicle - Centre of Excellence was signed by Dr.V.S.K.Venkatachalapathy, Director cum Principal, Sri Manakula Vinayagar Engineering college, and Mr. Mohammed Samiuddin, Deputy General Manager, TVS - Training & Services

Preamble for Electric Vehicle -Centre of Excellence

Sri Manakula Vinayagar Engineering College and TVS Training & Services signed a Memorandum of Understanding (MoU) and established a Centre of Excellence in Electric Vehicles.

This centre of Excellence has been equipped with state-of-the-art facilities to provide a conducive environment for research. With the investment of Rs.50 lakhs, Electric Vehicles Centre of Excellence is focussed on areas like BLDC/PMSM Motor Testing, Battery Management System, Cell Tester, ADAS Simulator and EV car setup.

It will serve as a hub for research, innovation, and collaboration in electric vehicle cutting-edge technology. Also, it will provide a platform for exchanging knowledge and ideas to facilitate the development of skills and expertise in this field for Students and Faculties. This centre of excellence provides value-added Industrial training with placement support.



Details of Students Training:

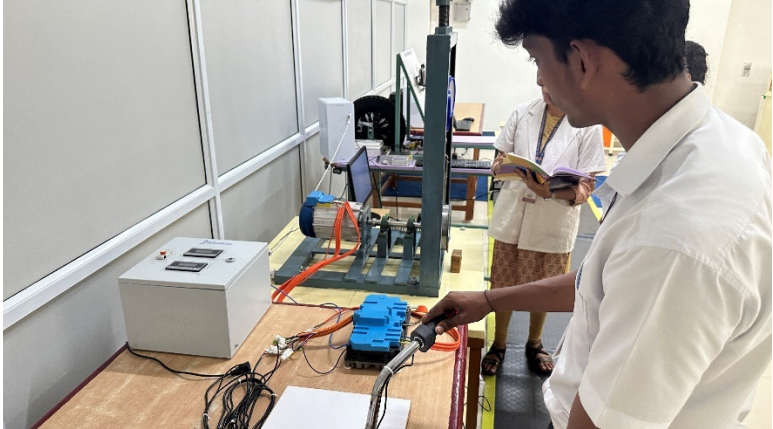
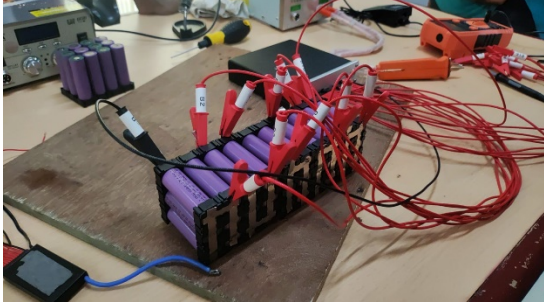
Batch	Start Date	End Date	Duration	Department	No. of students
1	26.8.2024	02.9.2024	5 Days	EEE	10
				MECH	12
				MCTR	07
				ICE	01
2	2.9.2024	09.9.2024	5 Days	EEE	12
				MCTR	08
				CSEBS	10
3	10.9.204	14.9.2024	5 Days	EEE	14
				ECE	04
				CSEBS	12
4	18.9.2024	24.9.2024	5 Days	EEE	19
				ECE	01
				MECH	10
5	25.9.2024	01.10.2024	5 Days	ECE	06
				CSE	13
				IT	10
				EEE	01
6	3.10.2024	10.10.2024	5 Days	EEE	09
				ECE	06
				CSE	05
				IT	10
7	6.01.2025	10.01.2025	5 Days	EEE	15
				ECE	15
8	20.01.2025	24.01.2025	5 days	EEE	30
9	27.01.2025	31.01.2025	5 days	EEE	19
				IT	11
10	17.3.2025	21.03.2025	5 days	EEE	15
				ECE	15
11	24.3.2025	28.03.2025	5 days	EEE	30
12	7.7.2025	11.7.2025	5 days	EEE	30
13	21.7.2025	25.7.2025	5 days	EEE	30
14	18.8.2025	22.08.2025	5 days	EEE	30
15	25.08.2025	30.08.2025	5 days	EEE	19
				CSEBS	11
16	08.09.2025	12.09.2025	5 days	Mech	30
17	05.02.2026	09.01.2026	5 days	EEE	24
				Mech	4
				CSEBS	2
Total					510

Students training:

Sl.No	Department	No. of students Batch-(1 to 17) attended
1	Electrical and Electronics Engineering	334
2	Electronics and Communication Engineering	32
3	Computer Science & Engineering	18
4	Information technology	31
5	Instrumentation and Control Engineering	1
6	Mechanical Engineering	51
7	Computer Science and Engineering and Business system	35
8	Mechatronics	8
Total		510

Already, 17 batches of 5-days ‘**Training Program on Electric Vehicles**’ have been completed for students through the Electric Vehicle-Centre of Excellence laboratory and training has been provided by TVS Training & Services Ltd., Chennai. In this regard, we are submitting details of number of students attended Training Program on Electric Vehicles from respective department in above table.

Electric Vehicle - Centre of Excellence

	Electric motor testing for PMSM and BLDC
	Cell testing upto 8 channels
	Battery pack equalizer with Active balancer with Bluetooth and Cell Assembler
	Electric vehicle station

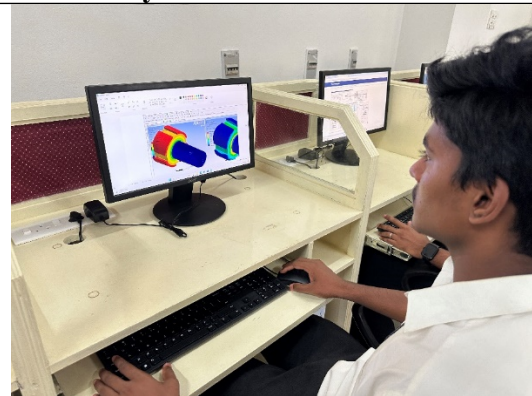
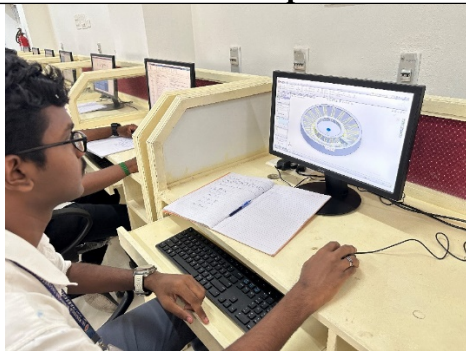


BMS continuously monitors battery voltage, current, and temperature to ensure safe operation.



Advanced Driver Assistance System (ADAS) simulator

Hands on experience through MATLAB and Ansys Simulation software



Students training:

This is for your kind information that our institution had signed a MoU with TVS Training and Services Ltd., Chennai on 28.3.2024 for Electric Vehicle-Centre of Excellence laboratory in our college premises. Electric Vehicle Laboratory with state-of-the-art equipment and infrastructure setups installation work has been completed at August month of this year. Already, six batches of 5-days '**Training Program on Electric Vehicles**' have been completed for students through the Electric Vehicle-Centre of Excellence laboratory and training has been provided by TVS Training & Services Ltd., Chennai. In this regard, we are submitting details of number of students attended Training Program on Electric Vehicles from respective department: -



5-days 'Training Programme on Electric Vehicles' for students through the Electric Vehicle-Centre of Excellence laboratory in our college premises.



The 17th batch of the 5-day **Training Program on Electric Vehicles** was conducted from **5th Jan to 9th Jan 2026**



The 16th batch of the 5-day **Training Program on Electric Vehicles** was conducted from **8th sep to 12th sep 2025**



The 15th batch of the 5-day **Training Program on Electric Vehicles** was conducted from
25th August to 30th August 2025



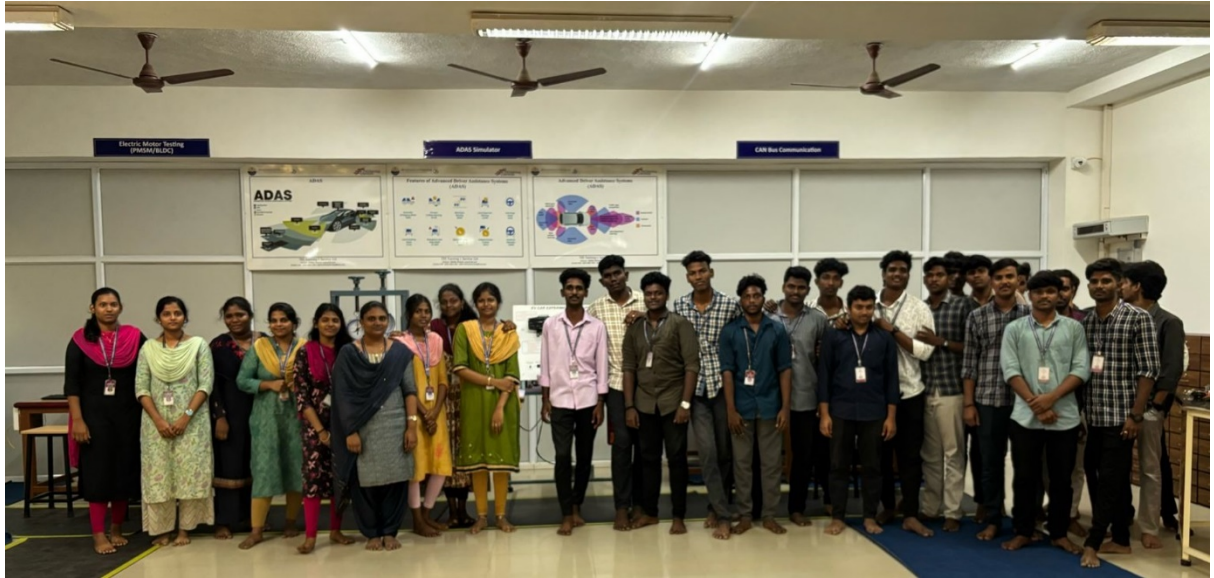
The 14th batch of the 5-day **Training Program on Electric Vehicles** was conducted from
18th August to 22nd August 2025



The 13th batch of the 5-day **Training Program on Electric Vehicles** was conducted from
21st July to 25th July 2025.



The 12th batch of the 5-day **Training Program on Electric Vehicles** was
conducted from **7th July to 11th July 2025.**



The 11th batch of the 5-day **Training Program on Electric Vehicles** was conducted from **March 24, 2025, to March 28, 2025.**



The tenth batch of the 5-day **Training Program on Electric Vehicles** was conducted from **March 17, 2025, to March 21, 2025.**



The ninth batch of the 5-day **Training Program on Electric Vehicles** was conducted from **January 27, 2025, to January 31, 2025.**



The eighth batch of the 5-day **Training Program on Electric Vehicles** was conducted from **January 20, 2025, to January 24, 2025.**



The seventh batch of the 5-day **Training Program on Electric Vehicles** was conducted from **January 6, 2025, to January 10, 2025.**



The sixth batch of the 5-day **Training Program on Electric Vehicles** was conducted from **October 3, 2024, to October 10, 2024.**



The fifth batch of the 5-day **Training Program on Electric Vehicles** was conducted from **September 25, 2024, to October 1, 2024.**



The fourth batch of the 5-day **Training Program on Electric Vehicles** was conducted from **September 18, 2024, to September 24, 2024.**



The third batch of the 5-day Training Program on Electric Vehicles was conducted from September 10, 2024, to September 14, 2024.



The second batch of the 5-day Training Program on Electric Vehicles was conducted from September 2, 2024, to September 9, 2024.

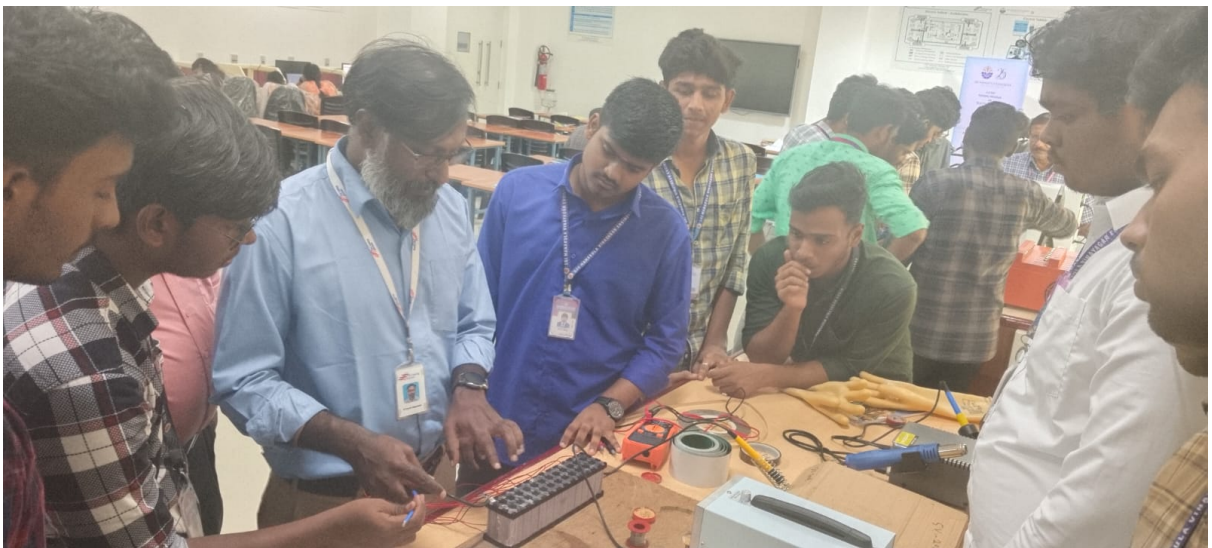


The first batch of the 5-day Training Program on Electric Vehicles was conducted from August 26, 2024, to September 2, 2024.

Gallery-Electric Vehicle Centre of Excellence



Gallery-Electric Vehicle Centre of Excellence



Gallery-Electric Vehicle Centre of Excellence



Gallery-Electric Vehicle Centre of Excellence



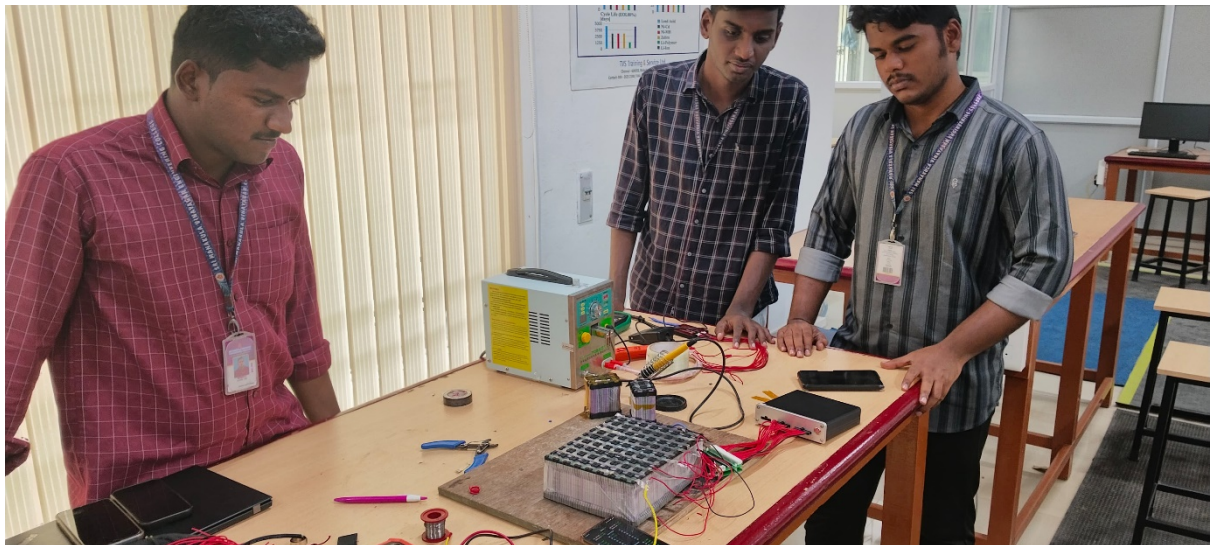
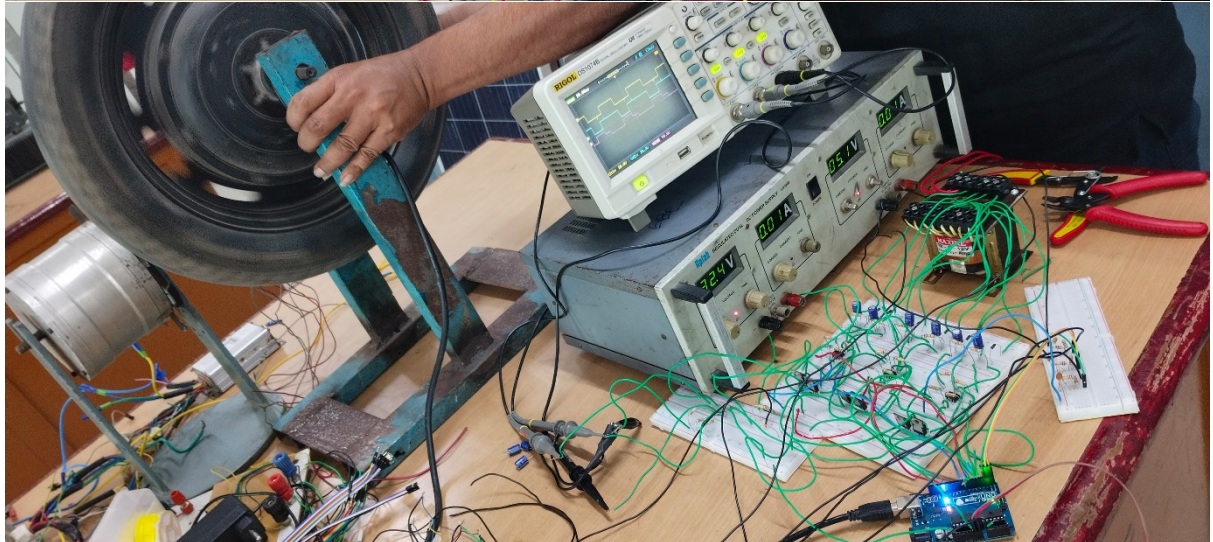
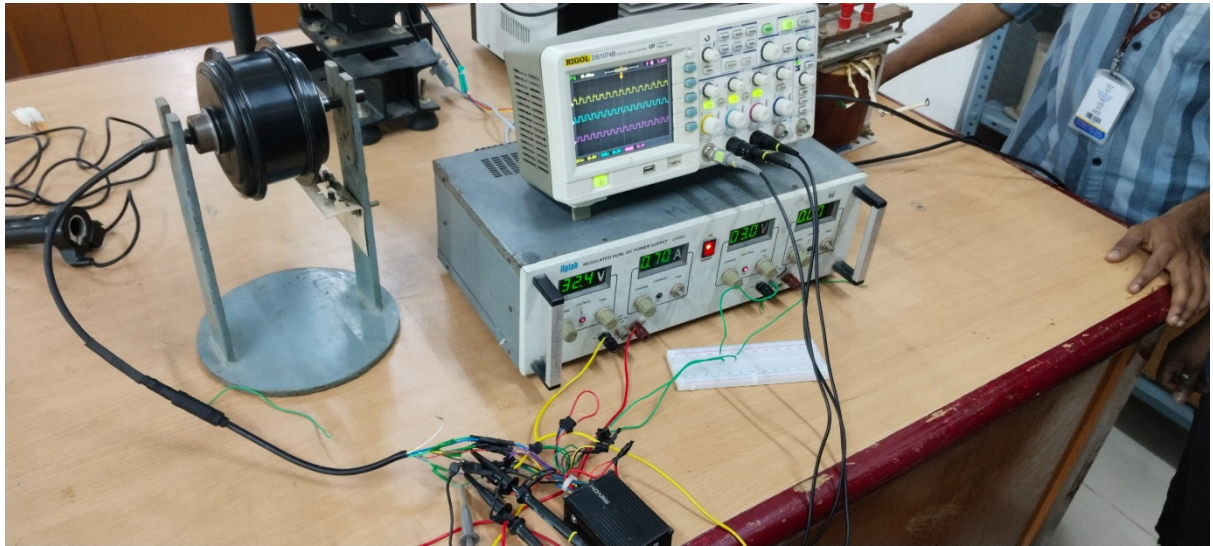
Gallery-Electric Vehicle Centre of Excellence



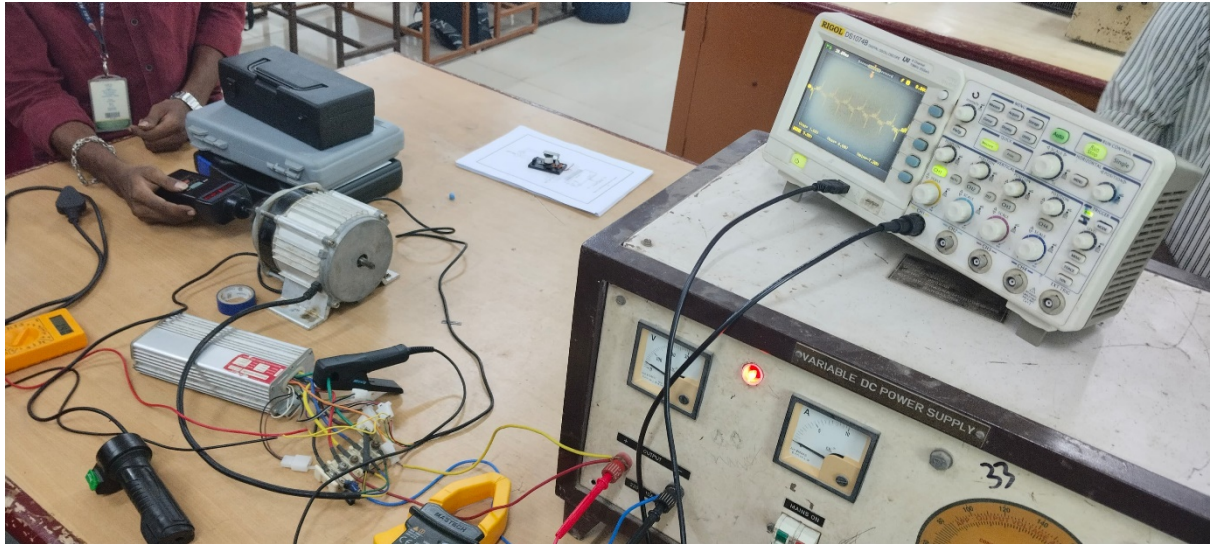
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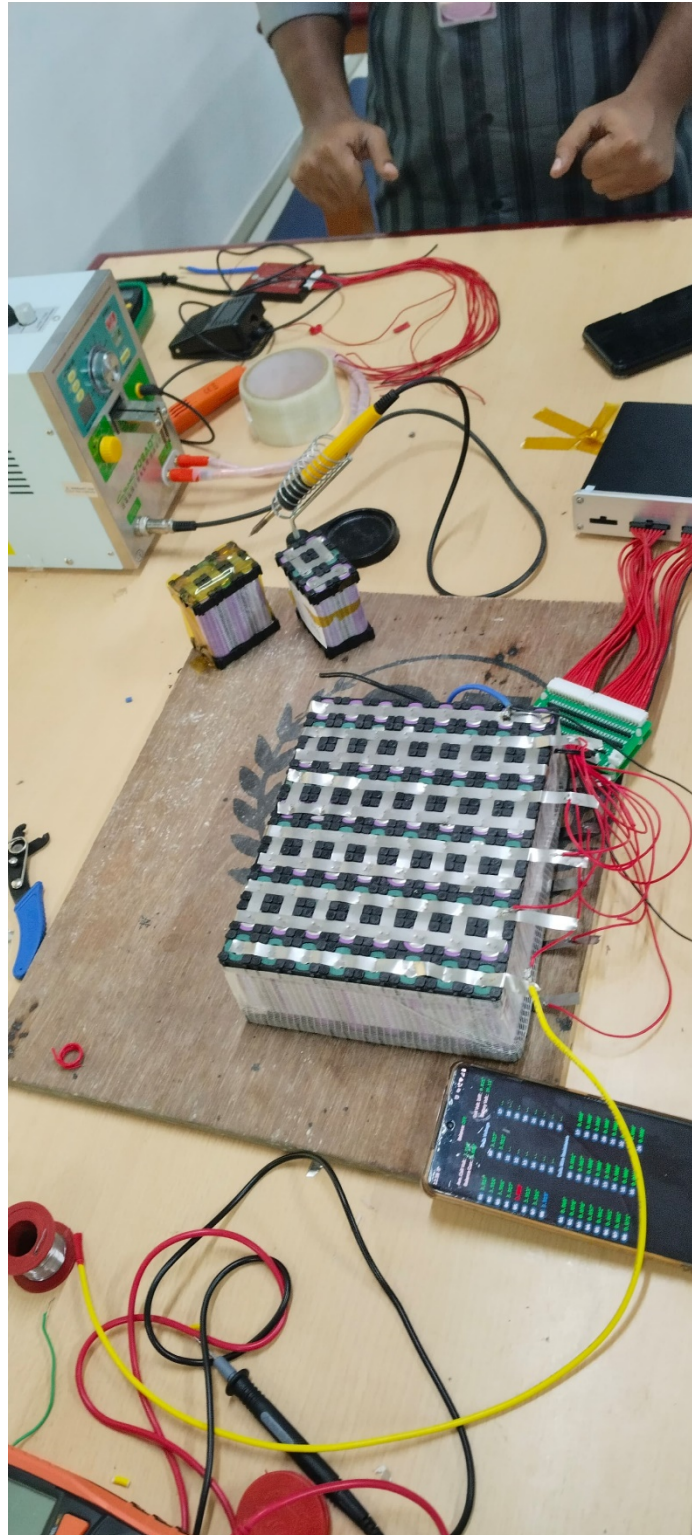
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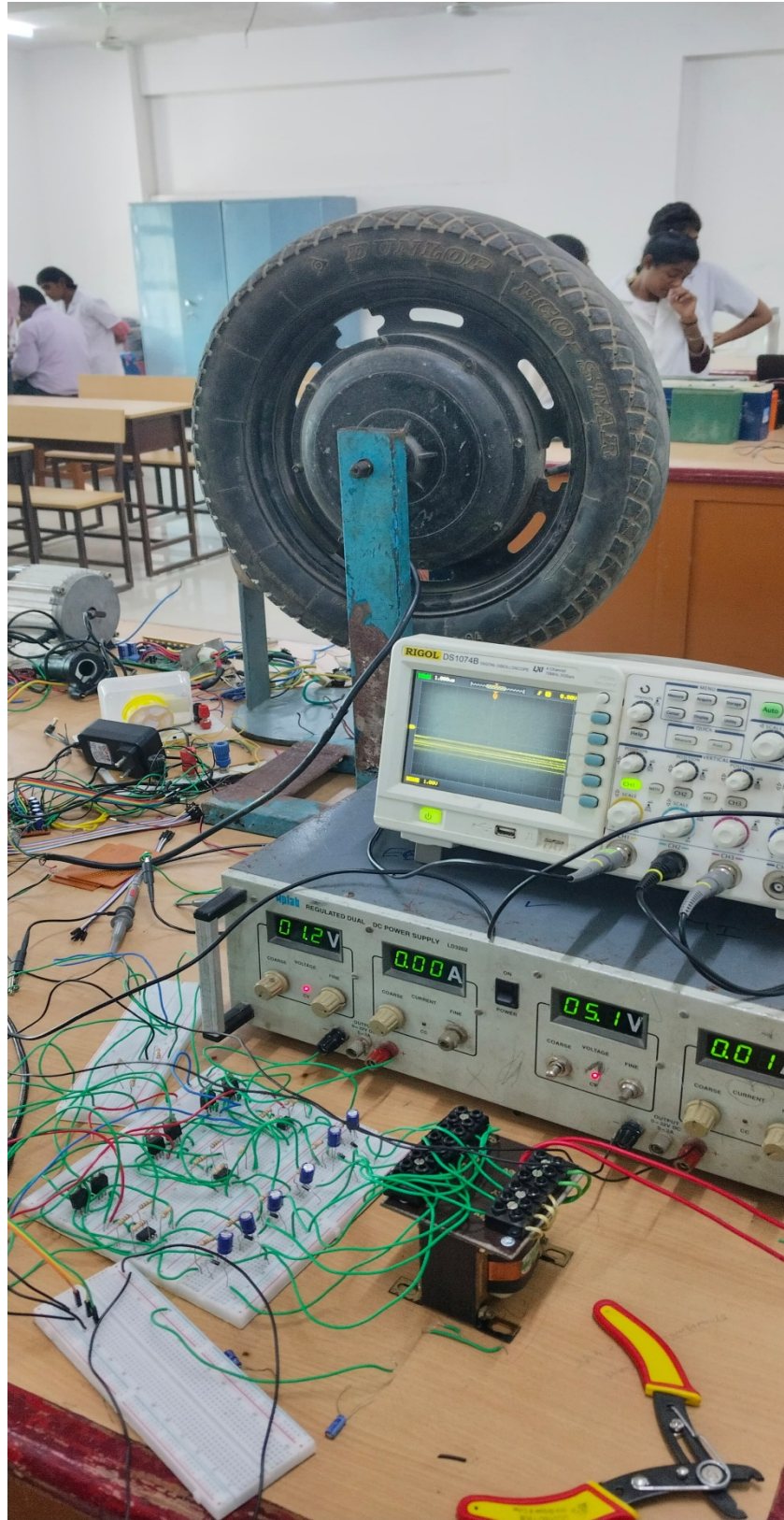
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Gallery-Electric Vehicle Centre of Excellence



Course Contents for 'Training program on Electric Vehicle'

Duration: 40 Hours (5 days)

Mode of Training: offline

Content outline:

SL.No	Module	Contents	No. of Hours
1	Safety	High Voltage (HV) Personal Safety - HV hazard - Awareness levels - HV boundaries - Warning labels	8
2	Electric Vehicle Architecture	Introduction to EV-Comparison between V vs Conventional Vehicle - Hybrid and Electrical vehicle architecture-Regenerative braking system – EV components	
3	ADAS (Advanced Driver Assistance System)	ADAS system, Levels, and Applications	
4	Battery Technology	Li-ion cell internal structure -Types of Battery for EV, Selection of Battery (Based on the characteristics), Battery cell Calculation- Battery Pack & Development –Battery pack construction using Spot welding-Testing of Batteries	8
	BMS (Battery Management System)	Architecture of Battery Management System -Measurement of Voltage, Current & Temperature - Algorithm for BMS-Testing of Battery pack with BMS, Simple programs using Microcontroller	8
5	Motors and Its Control	Types of Electric vehicle motors- BLDC, PMSM, Induction motor – Construction working principle & testing.	8
	Power Converters	Role of Power converters in EV, Types of Power converters for EV- DC to DC, DC to AC, AC to DC and AC to AC Converter. Testing of Power Converters, EV Power Train	4
6	CAN (Controller Area Network) in Automotive	Introduction to CAN communication, CAN Application and CAN uses	4

Outcome:

Candidates will be able to:

- Familiar in architecture of Electric Vehicle and its components.
- Compare different types of Motors & Batteries.
- Test the EV components.
- Select the major components in EV.
- Design the vehicle parameters for EV.
- Assemble and dismantle the Electric car.
- Understand the EV role in Indian Market.
- Acquire knowledge on EV Charger characteristics.
- Demonstration the HV PPE (Personal Protective Equipment) - 8 Cal/cm² kit.

Certification criteria

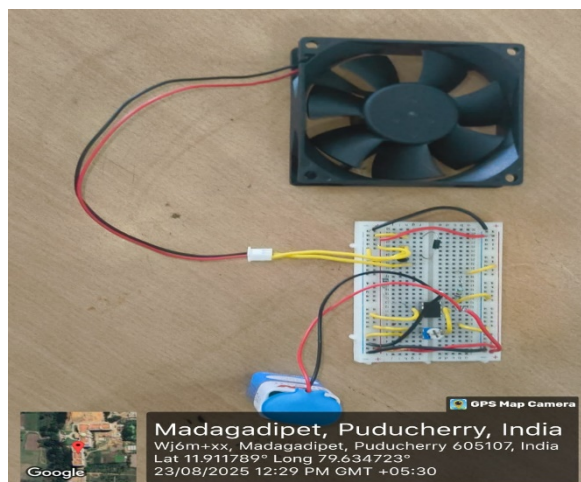
- Attendance – 90% Min
- Assignment completion – 100%
- Posttest assessment score – 70% Min

ACTIVITIES CARRIED DURING ACADEMIC YEAR 2025 - 2026

S.No	Date	Activities	Student Benefited
1.	23.08.2025	Design of Temperature Controlled Fan using Thermistor	61 II / EEE III / EEE

DESIGN OF TEMPERATURE CONTROLLED FAN USING THERMISTOR

Title	Design of Temperature Controlled Fan using Thermistor
Date	23.08.2025
Venue	Power Electronics Laboratory
Name of the Staff	Mr. G. Rajavel AP/EEE Mr. R. Vignesh AP/EEE
Audience	II Year and III Year EEE Students
No. of Students	60
E-Vehicle Club Incharges	Mr.S.Mugunthan, AP/EEE



When the temperature rises above the threshold point, then the DC fan will rotate to regulate the temperature.

INTRODUCTION

This activity focuses on the Design of a Temperature Controlled Fan an automatic electronic control system engineered to enhance energy efficiency and ensure the thermal safety of equipment. The system is designed to automatically activate a DC fan when the ambient temperature exceeds a set threshold and deactivate it when the temperature drops below that limit.

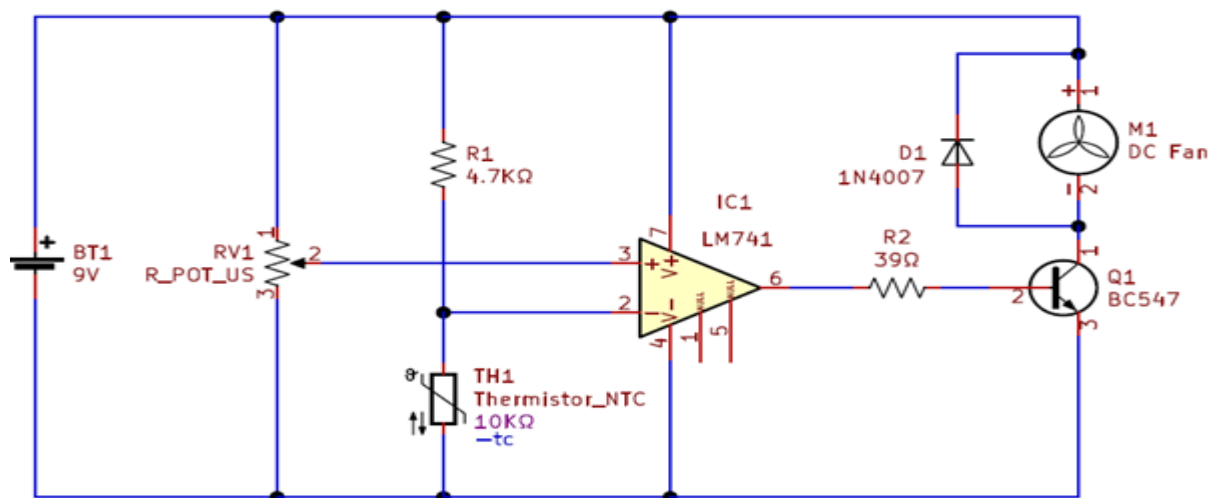
The core sensing component is a Negative Temperature Coefficient (NTC) thermistor, which varies its resistance inversely with temperature. This thermistor's signal is processed by an LM741 operational amplifier (op-amp), configured as a comparator, which establishes the threshold point against a reference voltage set by a potentiometer. The output of the op-amp controls a transistor switch (BC547/BC548) that drives the fan. A crucial protection measure is the inclusion of a flyback diode (1N4007) placed across the

motor terminals to suppress the inductive voltage spikes (back-EMF) generated during switching.

APPLICATIONS:

- Cooling for power supplies, amplifiers, chargers, and small enclosures where temperature-based automatic airflow is required.
- Smart ventilation for PCs, 3D-printer cabinets, battery packs, and automotive electronics compartments.
- Educational demonstration of thermistor sensing, op-amp comparators, and transistor switching for control systems labs.

CIRCUIT DIAGRAM OF TEMPERATURE CONTROLLED FAN :



WORKING OF TEMPERATURE CONTROLLED FAN:

The LM741 op-amp compares two voltages: the reference from the potentiometer at the non-inverting input and the temperature-dependent voltage from the NTC divider at the inverting input. As temperature rises, the NTC resistance falls, raising the divider voltage; when it crosses the set reference, the op-amp output goes high, biasing the BC547 through a base resistor to energize the DC fan; when temperature drops below the threshold, the output goes low and the fan turns off. The 1N4007 across the motor clamps inductive voltage spikes, preventing damage to the transistor and ensuring reliable operation.

DESIGN CALCULATION:

1. NTC at 45°C (B-parameter):

$$R_{NTC}(T) = R_{25} \cdot e^{B(T-298.15)}$$

At $T = 318.15 \text{ K (} 45^\circ\text{C)}$

$$R_{NTC}(45^\circ\text{C}) \approx 4,348 \, \Omega$$

2. Divider voltage at 45°C (inverting input):

$$V_{NTC} = V_{CC} \cdot R_1 / (R_{NTC} + R_1)$$

$$V_{NTC}(45^\circ C) \approx 9 \cdot 4700 + 43484348 \approx 4.33 \text{ V}$$

3. Pot setting (to get $V_{REF} = 4.33 \text{ V}$):

$$\text{Fraction } f = V_{REF} / V_{CC} = 4.33 / 9 \approx 0.4806 (\approx 48.06\%)$$

For 10 k Ω pot:

$$R_{\text{bottom}} \approx 4.81 \text{ k}\Omega, R_{\text{top}} \approx 5.19 \text{ k}\Omega$$

4. Base drive required (saturation rule):

$$\begin{aligned} I_B &\approx I_C / 10 \\ &= 150 \text{ mA} / 10 \\ &= 15 \text{ mA} \end{aligned}$$

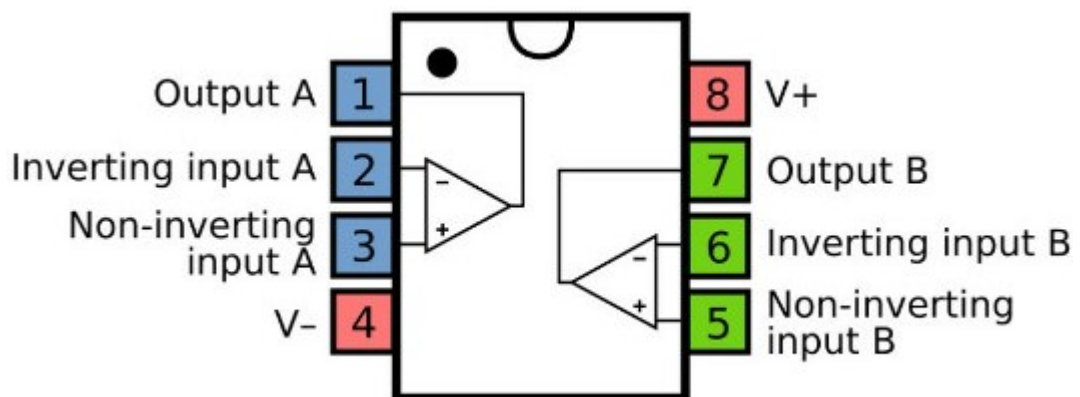
5. Base resistor R_B (choose standard):

$$\begin{aligned} R_B &= (V_{OH} - V_{BE}) / I_B \\ \text{With } V_{OH} &= 8.5 \text{ V} \\ R_B &\approx (8.5 - 0.7) / 0.015 \\ &\approx 520 \Omega \rightarrow \text{choose } 470 \Omega (\text{standard}) \\ \text{This gives } I_B &\approx (8.5 - 0.7) / 470 \\ &\approx 16.6 \text{ mA} \end{aligned}$$

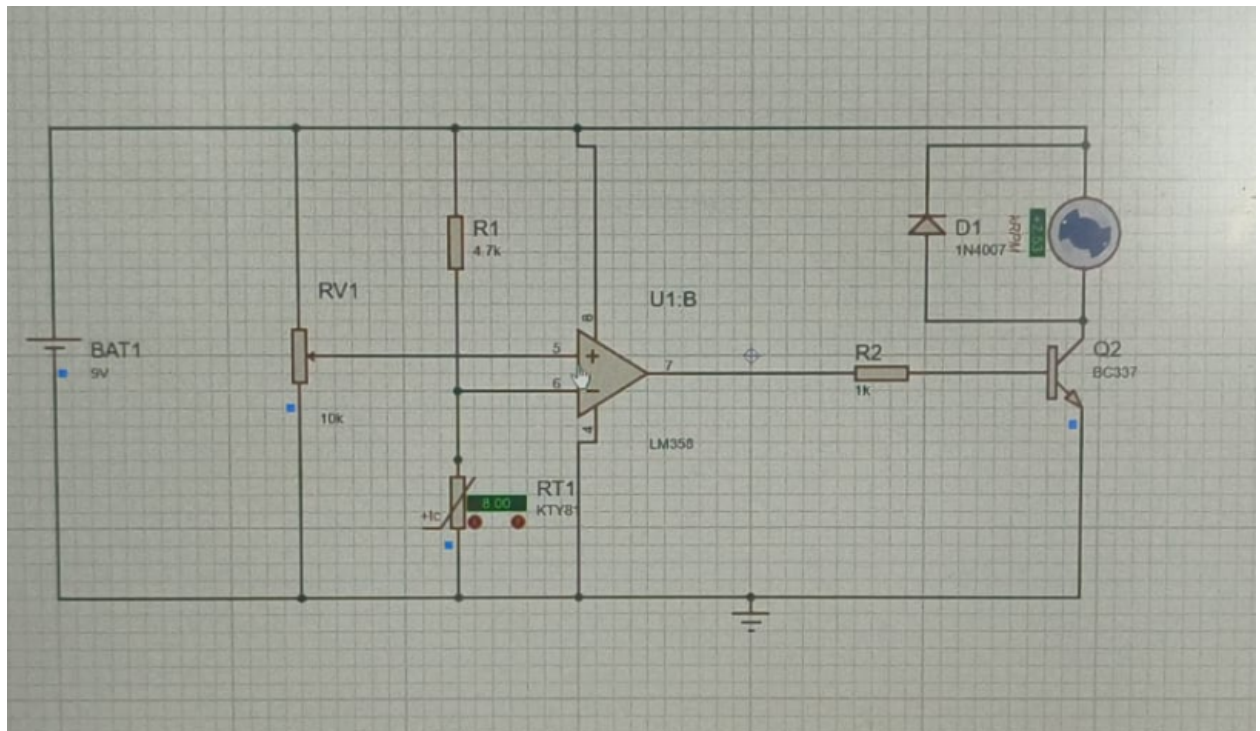
COMPONENTS REQUIRED FOR CIRCUIT:

S.No	Components	Specifications	Quantity
1	Op-amp	LM358	1
2	Resistor	4.7 k Ω , 39 Ω	1 each
3	Potentiometer	10K Ω	2
4	NTC Thermistor	MF52 10K (10 k Ω @ 25 $^\circ\text{C}$)	1
5	DC Fan	9 V brushless DC fan	1
6	Transistor	BC548	1
7	Diode	1N4007	1
8	Battery	9V	1
9	Wires	—	As Required

Pin Details of LM358



SIMULATION DIAGRAM OF TEMPERATURE CONTROLLED FAN:



OUTPUT:

PARAMETERS	THEORETICAL VALUE	SIMULATION VALUE	PRACTICAL VALUE
Supply Voltage	9V	9V	9V
Base Current of Q1(Fan OFF)	0.0 mA	0.00 mA	0.01 mA
Base Current of Q1(Fan ON)	7.3 mA	6.8 mA	6.5 mA
Voltage Across Q1(Fan OFF)	9.0 V	8.99 V	8.6 V
Voltage Across Q1(Fan ON)	0.2 V	0.15 V	0.28 V
Resistance across Thermistor (Fan ON)	2.5 k Ω	2.6 k Ω	2.7 k Ω
Resistance across Thermistor (Fan OFF)	8.0 k Ω	7.95k Ω	8.0 k Ω

