VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

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REPORT ON EVENT-2

THREE DAYS WORKSHOP ON ENGINEERING IDEATION AND PROTOTYPING WORKSHOP WITH ARDUINO

(12.11.2025 - 14.11.2025)

VEL TECH HIGH TECH - AICTE-IDEA LAB

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

#60,Avadi - Vel Tech Road, Vel Nagar,
Avadi, Chennai,
Tamil Nadu, India. Pincode:600062.

Prof. Dr. E. KAMALANABAN	**Prof. Dr. V.R. RAVI**		**Prof. Dr. R. SURESH**
AICTE IDEA LAB – CHIEF MENTOR	**AICTE IDEA LAB – COORDINATOR**		**AICTE IDEA LAB – CO-COORDINATOR**
Dr. S .SIVASARAVANA BABU	**Dr. S. RAJAMANICKAM**	**Dr. G. MAHALAKSHMI**	**Mr. M. PARTHIBAN**
Tech Guru	**Tech Guru**	**Tech Guru**	**Tech Guru**

WORKSHOP APPROVAL

DVHA/NOV/2025/4457 · P.No: 1050

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AICTE IDEA LAB

Proposal for Three days Workshop on Engineering Ideation and Prototyping workshop with Arduino (AY2025-2026) Odd Semester

1	Name of the event	:	"Engineering Ideation and Prototyping workshop with Arduino"
2	Event scheduled date	:	12.11.2025 To 14.11.2025
3	Name of the resource person	:	Dr. V. R. Ravi
4	Details of the guest speaker	:	Dean Academics, VTHT
5	Resource person profile attached	:	Yes
6	Acceptance letter from the resource person	:	Yes
7	Faculty in-charge for the event	:	Dr.S.Rajamanikam, Assistant Professor/Mech HTS 723, 8056036899 A/C: 75330100032890 BOB –VELTECH Branch, IFSC: BARB0VJVELT
8	No. of students	:	30 Students
9	Refreshment and Hospitality	:	35 Tea and Refreshment
10	Objective of the event	:	•To enable participants to understand Arduino hardware, programming, interfacing, and real-time application development. •To provide hands-on experience with Arduino for developing innovative prototypes and practical engineering solutions.
11	Outcome of the event	:	•Participants will be able to Write and execute Arduino programs for input/output operations. •Participants will design and implement functional Arduino-based prototypes, demonstrating practical understanding of embedded systems and creative problem-solving.
12	Budget	:	Expenses Budget Certificate, Banner & Report — Rs.1800.00 Participant Kit (30 No's) — Rs.900.00 Miscellaneous — Rs.1000.00 Total — Rs.3700.00
13	Website updation	:	Sha
14	Photography & Video Required	:	Yes
15	Event No	:	VTHT IDEA LAB /2025-26/02
			6.11.25 AICTE Idea Lab Coordinator — AICTE Idea Lab Co-Coordinator 6/11/25
16	Approval from principal	:	

GIT Events Organized

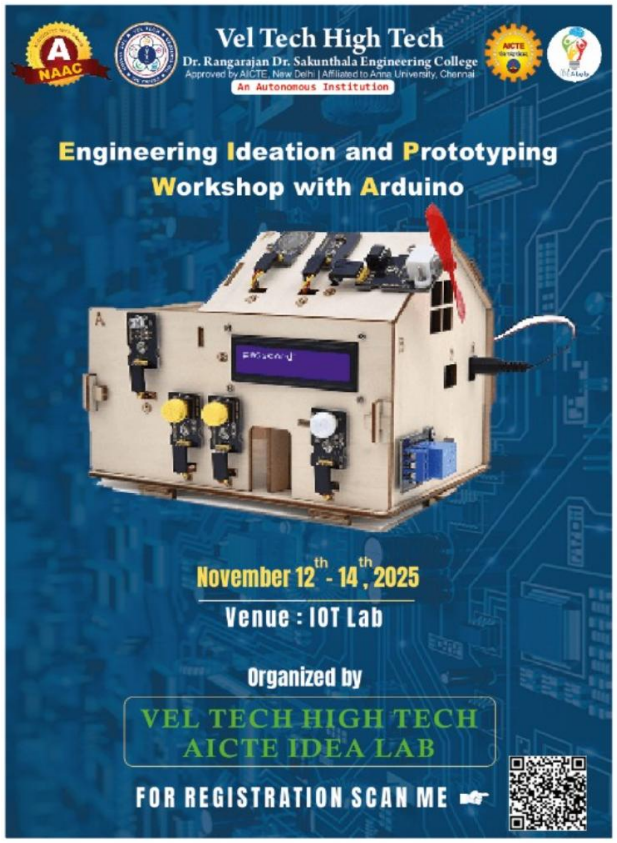
BUDGET ENTERED
Page No. VH-1086
Signature

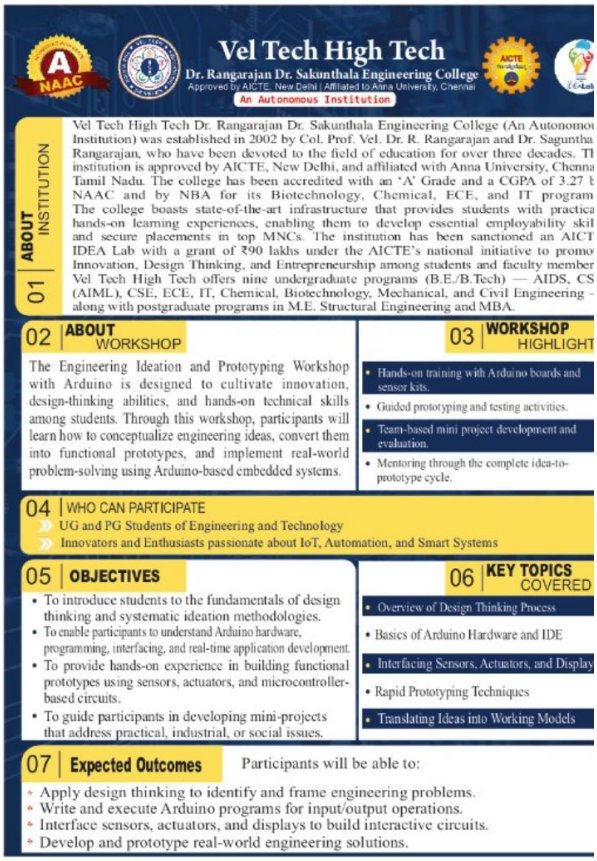
6/11/2025

NOTE TO ACCOUNT SECTION
Kindly debit this amount from AICTE IDEA LAB A/C : 92501001248011

Supportive document–NBA–2.2 & 2.7

WORKSHOP BROCHURE





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Three days Workshop on Engineering Ideation and Prototyping workshop with Arduino

PARTICIPANTS LIST

S.No	Student Name	VH Number	Dept.	Sem	Email ID	Mobile
1	ABHINAIYA SHRI M P	14829	AIDS	1	vh14829@velhightech.com	9150965396
2	AFZAL KHAN	14772	CSE	1	Vh14772@velhightech.com	9043191063
3	AJAY KUMAR U	14656	CSE	1	Vh14656@velhightech.com	6380136750
4	BHARATH S	14766	CSE	1	vh14766@velhightech.com	9597105882
5	DHARSAN KUMAR S	14680	CSE	1	vh14680@velhightech.com	8300262100
6	GUBENDRA MOORTHY K	14648	CSE	1	VH14648@velhightech.com	7200937470
7	GURU SANJEETH	15228	CSE - AIML	1	Vh15228@velhightech.com	8608486088
8	HARINI NADAR M	14628	CSE	1	vh14628@velhightech.com	9843811219
9	HARISH R	14923	AIDS	1	vh14923@velhightech.com	7448806198
10	HIRTHIK D	14800	AIDS	1	vh14800@velhightech.com	9500025730
11	JAGADEESH P	14911	AIDS	1	vh14911@velhightech.com	9444484762
12	KAMNA JAI J	14805	AIDS	1	vh14805@velhightech.com	9003020238
13	KEERTHIGA RANI S	14650	CSE	1	vh14650@velhightech.com	8610263469
14	MERLIN DEEPTHI R	14915	AIDS	1	vh14915@velhightech.com	8438294284
15	MOHNISH RAO D	14737	CSE	1	vh14737@velhightech.com	7449078949
16	MUTHARASI S	14713	CSE	1	vh14713@velhightech.com	8778279341
17	NANDHA H	14624	CSE	1	vh14624@velhightech.com	7200523236
18	NAVEEN KUMAR S	14908	AIDS	1	vh14908@velhightech.com	7904395632
19	NIVEDHITHA S	14614	CSE	1	Vh14614@velhightech.com	7010793427
20	R.MANAV JAIN	14848	AIDS	1	vh14848@velhightech.com	7200079768
21	SAKTHI S S	14661	CSE	1	vh14661@velhightech.com	8825662207
22	SHARINA DEVI S	14662	CSE	1	vh14662@velhightech.com	8807478314
23	SWETHA A	14913	AIDS	1	vh14913@velhightech.com	6382948572
24	TAMILVEL T	14723	CSE	1	vh14723@velhightech.com	7538870730
25	THARUN VIJAY M	14830	AIDS	1	vh14830@velhightech.com	8220310296
26	VEDHIGHA SREE K G	14769	CSE	1	vh14769@velhightech.com	9043067958
27	YOKESHWARAN M	14828	AIDS	1	vh14828@velhightech.com	8438916244
28	ABDUL RASHEED M	14979	AIDS	1	vh14979@velhightech.com	9444153282

3-Day Agenda: Workshop on Engineering Ideation and Prototyping workshop with Arduino

DATE	TIME	AGENDA
12.11.25	08.15– 09.15	Registration & Welcome Address
	09.15 – 09.45	Inaugural Session and Workshop Overview
	09.45 – 11.15	**Session 1:** Introduction to Design Thinking – Principles, Empathize & Define Stages, Problem Framing
	11.15–11.30	Tea Break
	11.30– 12.30	Hands-on Session: Arduino Fundamentals – Board Architecture & Components Overview
	12.30 – 01.15	Lunch Break
	01.15 – 02.00	**Session 2:** Sensors & Actuators Overview, Arduino IDE Installation and Setup
	02.00 – 03.30	Hands-on Practice: Basic Arduino Programming – LED Blinking, Push Button and Buzzer Control
13.11.25	08.15–09.00	Recap of Day 1 & Team Formation Discussion
	09.00–10.30	**Session 3:** Ideation Techniques – Brainstorming, SCAMPER Method, and Mind Mapping
	10.30 – 10.45	Tea Break
	10.45 – 12.45	Hands-on Session: Sensor Interfacing – Temperature Sensor, Ultrasonic Sensor and IR Sensor
	12.45 – 01.15	Lunch Break
	01.15 – 02.45	**Session 4:** Actuator Interfacing – Servo Motors, DC Motors, and Display Modules
	02.45 – 03.30	Team Activity: Concept Sketching, System Flowchart and Block Diagram Preparation
14.11.25	08.15–09.00	Recap of Day 2 & Finalization of Prototype Ideas
	09.00–10.30	Prototype Development – Phase 1: Circuit Wiring and Coding Logic
	10.30 – 10.45	Tea Break
	10.45 – 12.45	Prototype Development – Phase 2: Refinement, Debugging and Feature Enhancement
	12.45 – 01.15	Lunch Break
	01.15 – 02.45	System Testing, Iterations and Demo Preparation
	02.45 – 03.30	Team Presentations and Prototype Demonstrations
	03.30 – 04.00	Valedictory Session and Certificate Distribution

CHIEF GUEST PROFILE

Dr. V. R. Ravi is a distinguished academician and researcher with over **three decades of combined academic and industrial experience**. He earned his **Bachelor's Degree in Instrumentation and Control Engineering** from **Bharathiar University** in 1988, followed by a **Master's Degree in Applied Electronics** from the prestigious **PSG College of Technology** in 1995. He obtained his **Doctorate in Process Control** from **MIT CAMPUS-Anna University, Chennai**, in 2013.

With **28 years of teaching** and **8 years of industry experience**, Dr.V.R.Ravi currently serves as a **DEAN ACADEMICS** at **Vel Tech High Tech Dr. Rangarajan Dr. Sakunthala Engineering College, Chennai**. His career reflects a deep commitment to academic excellence, research innovation, and industry–institute collaboration.

Dr.V.R.Ravi has successfully executed **SixFunded projects**worth of **Rs 1.25 Cores**sponsored by the **All India Council for Technical Education (AICTE)** and **seven industry-sponsored consultancy projects**, demonstrating his ability to translate academic research into industrial applications. In addition, he has completed **four innovative projects**worth of **Rs 8.0 Lakhs**funded by the **Department of Science and Technology (DST)** under the **Innovation and Entrepreneurship Development Centre (IEDC)** scheme.

He has made notable scholarly contributions with **11 research papers published in international journals** and **34 papers presented at international and national conferences**. His industrial exposure includes specialized training at reputed organizations such as **South India Viscose - Coimbatore**, **SPIC - Tuticorin**, **Seshasayee Paper & Boards Limited - Erode, Madras Refinery Limited – Chennai** and **National Instruments -Bangalore**.

Dr.V.R.Ravi's **areas of expertise** encompass **Process Control, Robotics and Automation, Embedded System Design, Soft Computing, Machine Learning, Internet of Things (IoT),** and **Image Processing**. His research interests focus on the integration of intelligent systems with real-time control and automation solutions.

He has been instrumental in organizing numerous **national-level workshops, seminars, short-term training programs (STTPs), and faculty development programs (FDPs)** sponsored by premier agencies such as **AICTE, DRDO, ICMR,** and **BRNS**. He has also delivered more than **24 invited lectures** at various engineering institutions across **Tamil Nadu, Karnataka,** and **Andhra Pradesh**, sharing his expertise with the academic community.

In addition to academic initiatives, Dr.V. R. Ravi has designed and conducted **value-added courses** and hands-on training programs in **LabVIEW (Core I & II)**, **MATLAB programming**, **Arduino-based applications**, and **Raspberry Pi-based embedded systems**, fostering skill development among students and faculty.

His excellence has been recognized through several prestigious honors, including the **National Merit Scholarship** from the **Ministry of Education and Social Welfare, Government of India**, and the **First Prize in the State-Level Best Project Award** from the **Directorate of Technical Education (DOTE), Tamil Nadu**, in 1988. He was also conferred with a **Gold Medal** and inducted as a **Premier Member of the "India LabVIEW Developer League"** by **National Instruments, Bangalore**, in 2010.

Dr. V. R Ravi's sustained contributions to bridging academia and industry earned him special appreciation from **DST–Texas Instruments** for fostering an ecosystem of **innovation, collaboration, and entrepreneurship** through the **India Innovation Challenge Design Contest (IICDC)** in 2018.

Three Day Workshop on Engineering Ideation and Prototyping Workshop with Arduino – DETAILED REPORT

This report presents a comprehensive account of the Three Day Workshop on Engineering Ideation and Prototyping Workshop with Arduino, conducted from 12.11.2025 to 14.11.2025. The workshop was designed to provide participants with an experiential learning environment that blended creative thinking, engineering fundamentals, and hands-on prototyping. By integrating engineering ideation methodologies with embedded systems and Arduino-based development, the workshop enabled participants to transform innovative concepts into working engineering models.

Throughout the three days, participants actively engaged in activities that enhanced their ability to understand user requirements, frame real-world engineering problems, generate innovative ideas, and develop functional prototypes through systematic experimentation. The programme included expert lectures, interactive discussions, live demonstrations, hardware interfacing sessions, team-based challenges, and guided prototype development exercises, with a strong focus on problem-solving, creativity, teamwork, and real-world application.

DAY 1: 12.11.2025 — Inauguration, Introduction to Design Thinking & Arduino Fundamentals

The first day commenced with registration, followed by a formal welcome address by Dr. E. Kamalanaban, Principal and Chief Mentor, AICTE IDEA Lab. In his address, he expressed his happiness in witnessing enthusiastic student participation in a workshop that seamlessly integrates creativity with engineering practice. He highlighted the vision and mission of the AICTE IDEA Lab in promoting innovation, design skills, and hands-on technical learning among budding engineers.

Dr. E. Kamalanaban emphasized the importance of nurturing an innovative and user-centric mindset, encouraging participants to fully utilize the learning opportunity. He stressed that practical, hands-on exposure plays a vital role in shaping industry-ready engineers and expressed confidence that the combination of engineering ideation and

Arduino-based prototyping would enable students to develop solutions addressing real societal challenges. His inspiring address set a positive and motivating tone for the workshop.

Welcome Address by the Principal (Short Text)

The Principal warmly welcomed all participants to the Three Day Workshop on Engineering Ideation and Prototyping Workshop with Arduino. He expressed his joy in seeing young and enthusiastic minds prepared to explore creativity, technology, and problem-solving. He emphasized that the AICTE IDEA Lab stands as a symbol of the institution's commitment to innovation, experiential learning, and interdisciplinary collaboration.

He encouraged participants to actively engage in hands-on activities, brainstorming sessions, and prototype development throughout the workshop. He motivated them to think creatively, work collaboratively, and make the best use of the resources and expert guidance available. He concluded by wishing all participants a productive, inspiring, and enriching learning experience.

Session 1: Introduction to Engineering Ideation

Following the inaugural session, the first technical session focused on Engineering Ideation, a structured and systematic approach to problem-solving. The resource person introduced the principles of user-centric thinking, problem

identification, and idea generation frameworks. Participants were guided through stages such as understanding user needs, defining engineering problem statements, and exploring innovative solution pathways.

Real-world case studies were discussed to demonstrate how engineering ideation is applied in industry to develop effective solutions. Participants actively engaged in group activities that involved empathy mapping, need analysis, and problem framing, thereby strengthening their critical thinking and collaborative skills.

Session 2: Arduino Basics — Board Architecture and Programming Fundamentals

The second session introduced participants to the Arduino Uno development platform. Learners gained knowledge of the microcontroller's architecture, pin configuration, power management, and digital and analog input/output features. The facilitator demonstrated the installation and use of the Arduino IDE, explaining sketch structure, libraries, and program uploading procedures.

In the hands-on segment, participants interfaced basic electronic components such as LEDs, resistors, buzzers, and push buttons. They practiced fundamental programs using digitalWrite, digitalRead, delay, and conditional logic. This session helped participants build confidence in both hardware connections and embedded programming, creating a strong foundation for advanced applications.

Day 2: 13.11.2025 — Ideation Techniques, Sensor Interfacing & Concept Development

Day 2 began with a structured recap session and team discussions, allowing participants to reflect on their learning and clarify concepts. This collaborative exercise promoted peer learning and set the stage for more advanced technical sessions.

Session 3: Ideation Techniques

Participants were introduced to various ideation techniques such as Brainstorming, SCAMPER, and Mind Mapping. The facilitator explained how these tools help generate diverse solution ideas and encourage creative thinking. Teams practiced applying these techniques to real engineering problems, resulting in multiple innovative concept proposals.

Hands-on Session: Sensor Interfacing

One of the major highlights of the workshop was the hands-on session on sensor interfacing. Participants worked with temperature sensors (LM35, DHT11), ultrasonic sensors, and infrared (IR) sensors. They learned how to read sensor data, process it using Arduino, and visualize outputs through the serial monitor.

Students experimented with threshold-based logic, sensor calibration, and environmental factors influencing sensor behaviour. This session significantly improved their practical skills in embedded systems and real-time data handling.

Session 4: Actuator Interfacing & Concept Sketching

Post-lunch, participants were introduced to actuators and output devices, including servo motors, DC motors, stepper motors, and display modules such as 16×2 LCDs and OLED screens. They learned how to use PWM (Pulse Width Modulation) techniques to control motor speed and positioning.

The day concluded with a concept sketching and blocks diagram activity, where teams converted their ideas into structured system architectures. This activity helped participants visualize circuit layouts, understand signal flow, and finalize component requirements for their prototypes.

Day 3: 14.11.2025 — Prototype Development, Testing & Demonstrations

The final day started with a progress review session where teams finalized their prototype concepts. During Prototype Development – Phase 1, participants focused on circuit wiring, component integration, and coding logic. Facilitators provided hands-on guidance to troubleshoot errors and refine circuit designs.

In Prototype Development – Phase 2, teams optimized their prototypes through debugging, performance enhancement, and feature refinement. After lunch, teams carried out testing, iterative improvements, and demo preparation to ensure reliable and stable operation.

The workshop concluded with Team Presentations and Prototype Demonstrations, where each group explained their problem statement, ideation process, system architecture, and final working model. The Valedictory Session and Certificate Distribution marked the successful completion of the programme.

OVERALL SUMMARY

The **Three Day Workshop on Engineering Ideation and Prototyping Workshop with Arduino** successfully integrated creative design processes with hands-on engineering practice. Participants developed strong capabilities in understanding user needs, framing engineering problems, generating innovative ideas, and building functional prototypes using Arduino.

The workshop enhanced participants' technical competence in sensors, actuators, and embedded programming while also strengthening their **teamwork, creativity, and analytical thinking skills**. The enthusiastic participation and innovative prototype demonstrations reflected the success of the workshop in promoting **project-based learning, engineering innovation, and practical skill development**.

PARTICIPANTS ATTENDANCE DETAILS

VEL TECH HIGH TECH

Dr.RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

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AICTE-IDEA LAB

Three days Workshop on Engineering Ideation and Prototyping workshop with using Arduino

Attendance Sheet

S.No	VII Number	Student Name	Semester	Branch	12.11.2025		13.11.2025		14.11.2025	
					FN	AN	FN	AN	FN	AN
1	14829	ABHINAIYA SHRI M P	1	AIDS						
2	14772	AFZAL KHAN	1	CSE						
3	14656	AJAY KUMAR U	1	CSE						
4	14766	BHARATH S	1	CSE						
5	14680	DHARSAN KUMAR S	1	CSE						
6	14648	GUBENDRA MOORTHY K	1	CSE						
7	15228	GURU SANJEETH V	1	CSE						
8	14628	HARINI NADAR M	1	CSE						
9	14923	HARISH R	1	AIDS						
10	14800	HIRTHIK D	1	AIDS			AB	AB	AB	AB
11	14911	JAGADEESH P	1	AIDS						
12	14805	KAMNA JAI J	1	AIDS						
13	14650	KEERTHIGA RANI S	1	CSE						
14	14915	MERLIN DEEPTHI R	1	AIDS						
15	14737	MOHNISH RAO D	1	CSE						

AICTE IDEA LAB
CO-CORDINATOR

14.11.25
AICTE IDEA LAB
CORDINATOR

AICTE IDEA LAB
CHIEF MENTOR

PARTICIPANTS ATTENDANCE DETAILS

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Three days Workshop on Engineering Ideation and Prototyping workshop with using Arduino

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					FN	AN	FN	AN	FN	AN
16	14713	MUTHARASI S	1	CSE						
17	14624	NANDHA H	1	CSE						
18	14908	NAVEEN KUMAR S	1	AIDS						
19	14614	NIVEDHITHA S	1	CSE						
20	14848	R.MANAV JAIN	1	AIDS						
21	14661	SAKTHI S S	1	CSE						
22	14662	SHARINA DEVI S	1	CSE						
23	14913	SWETHA A	1	AIDS						
24	14723	TAMILVEL T	1	CSE						
25	14830	THARUN VIJAY M	1	AIDS						
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27	14828	YOKESHWARAN M	1	AIDS						
28	14979	ABDUL RASHEED M	1	AIDS						

AICTE IDEA LAB
CO-CORDINATOR

AICTE IDEA LAB
CORDINATOR

AICTE IDEA LAB
CHIEF MENTOR

SAMPLE CERTIFICATES

Vel Tech High Tech
Dr. Rangarajan Dr. Sakunthala Engineering College
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BEST APPRECIATION

VEL TECH HIGH TECH- AICTE IDEA LAB

CERTIFICATE OF APPRECIATION

This is to certify that Ms ABHINAIYA SHRI M P
from Vel Tech High Tech Dr. Rangarajan Dr. Sakunthala Engineering College has participated in
Engineering ideation and prototyping workshop with Arduino
organized by VEL TECH HIGH TECH - AICTE IDEA LAB at Vel Tech High Tech Dr. Rangarajan Dr. Sakunthala Engineering College, Avadi, Chennai, Tamil Nadu, India during 12th to 14th Nov 2025.

Prof. Dr. R. Suresh
AICTE-IDEA LAB CO-COORDINATOR

Prof. Dr. V. R. Ravi
AICTE-IDEA LAB COORDINATOR

Prof. Dr. E. Kamalanaban
AICTE-IDEA LAB CHIEF MENTOR

Vel Tech High Tech
Dr. Rangarajan Dr. Sakunthala Engineering College
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BEST APPRECIATION

VEL TECH HIGH TECH- AICTE IDEA LAB

CERTIFICATE OF APPRECIATION

This is to certify that Mr NANDHA H
from Vel Tech High Tech Dr. Rangarajan Dr. Sakunthala Engineering College has participated in
Engineering ideation and prototyping workshop with Arduino
organized by VEL TECH HIGH TECH - AICTE IDEA LAB at Vel Tech High Tech Dr. Rangarajan Dr. Sakunthala Engineering College, Avadi, Chennai, Tamil Nadu, India during 12th to 14th Nov 2025.

Prof. Dr. R. Suresh
AICTE-IDEA LAB CO-COORDINATOR

Prof. Dr. V. R. Ravi
AICTE-IDEA LAB COORDINATOR

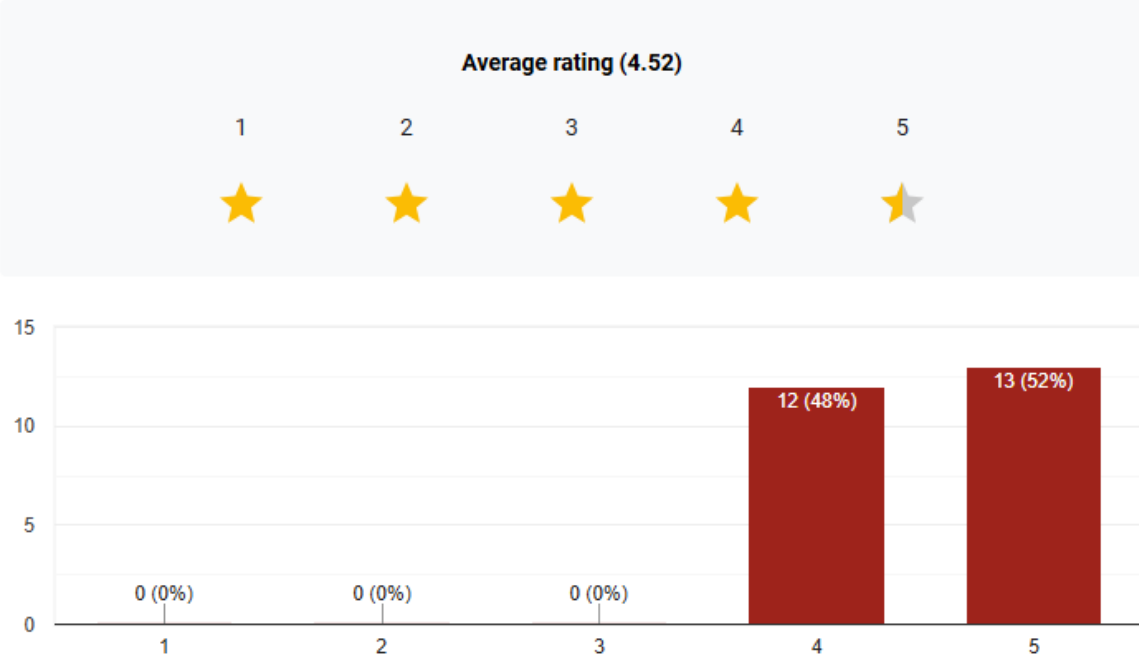
Prof. Dr. E. Kamalanaban
AICTE-IDEA LAB CHIEF MENTOR

PARTICIPANTS FEEDBACK

Clarity of workshop objectives and expected learning outcomes

Copy chart

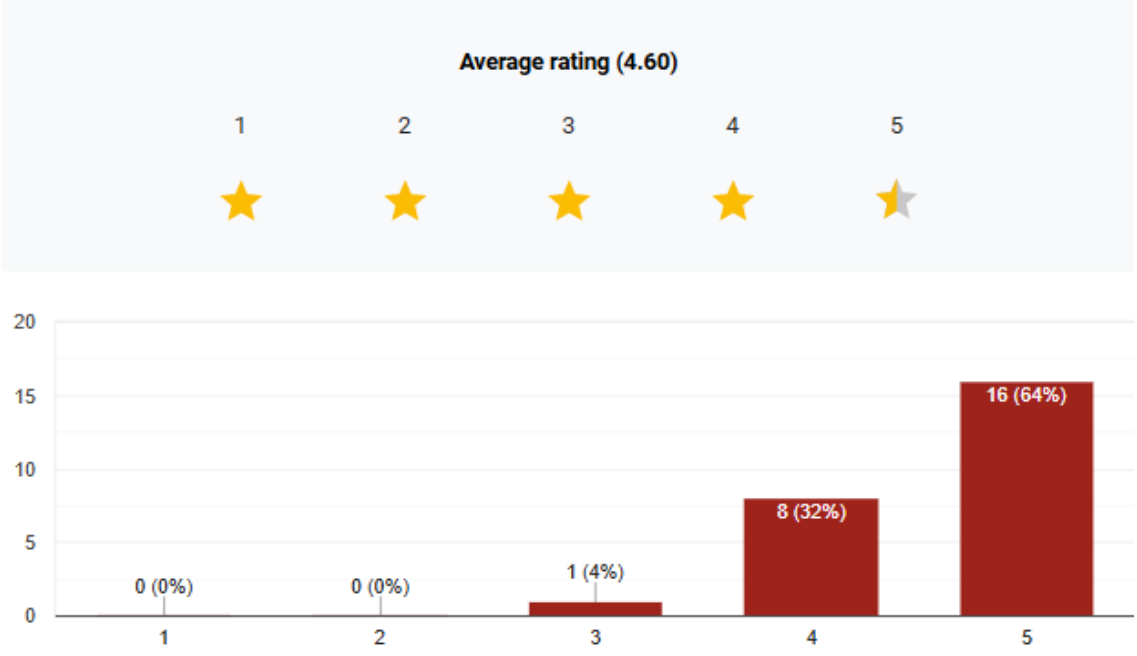
25 responses



How effectively did the workshop enhance your understanding of Design Thinking, Arduino applications, and problem-solving skills

Copy chart

25 responses

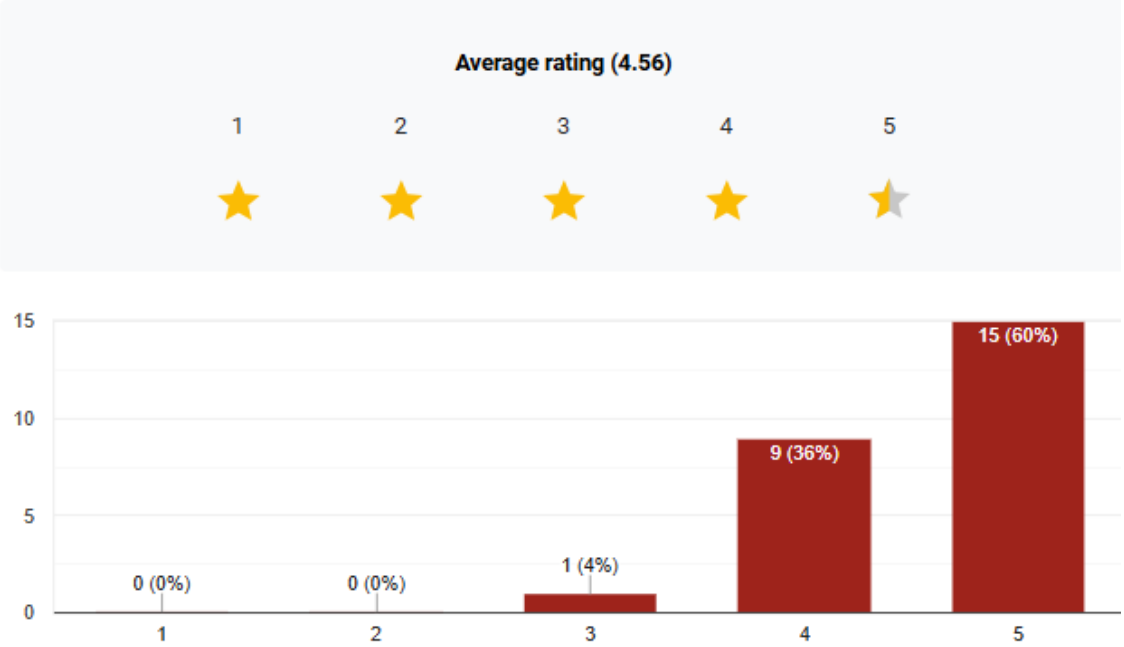


PARTICIPANTS FEEDBACK

This workshop covered the objectives well

Copy chart

25 responses



Balance between theoretical concepts and practical applications

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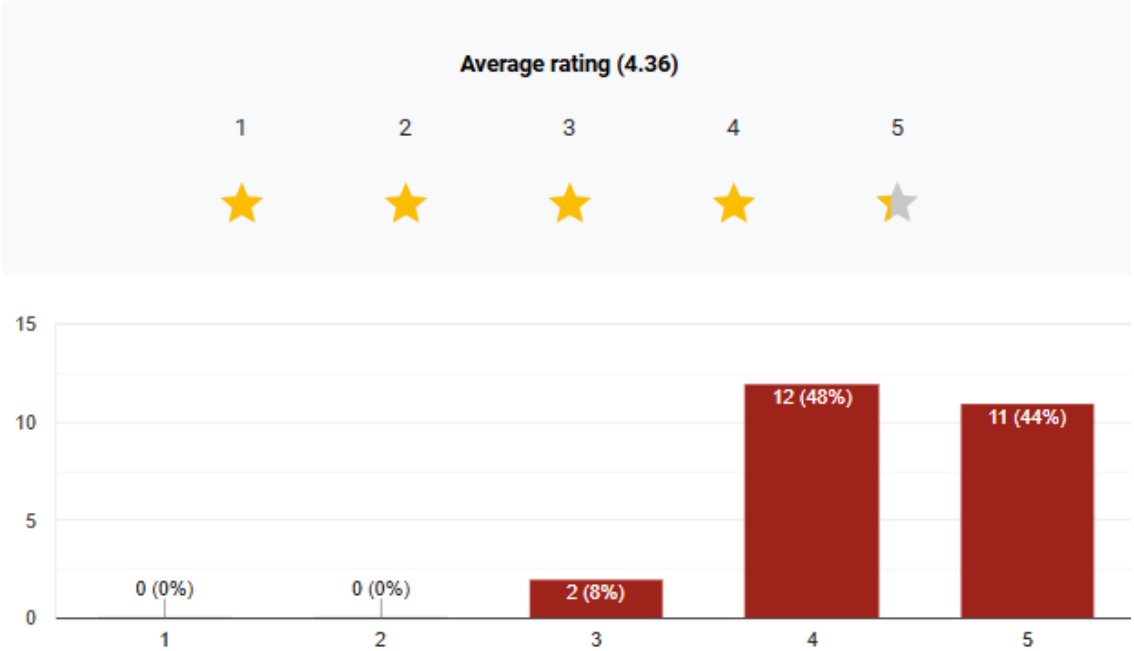
25 responses

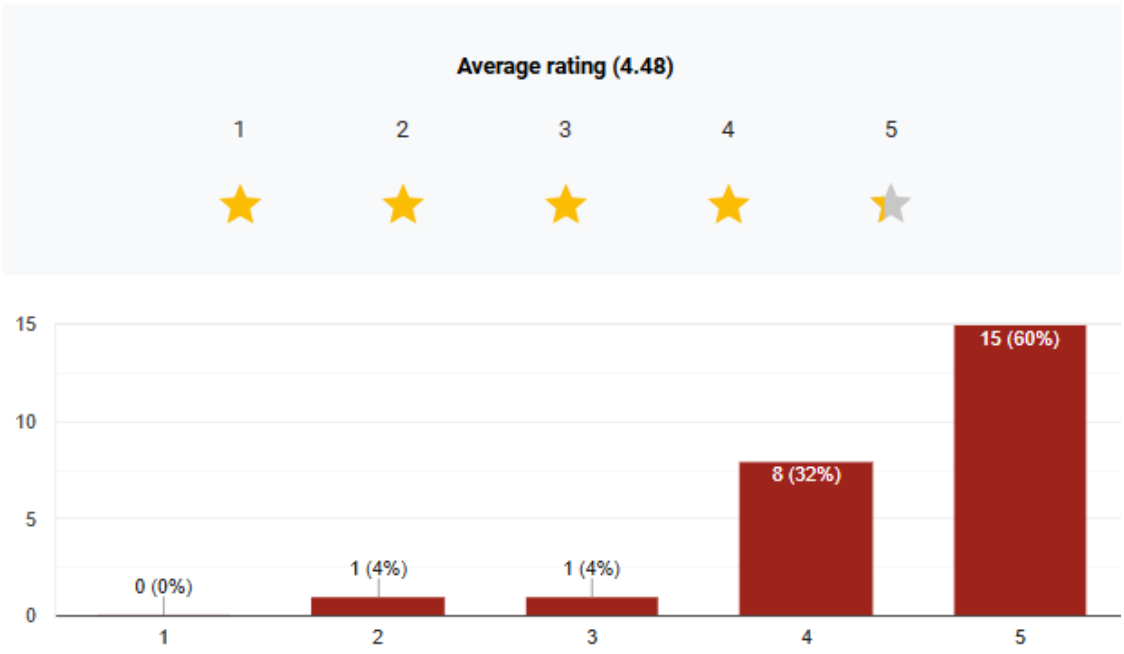


PARTICIPANTS FEEDBACK

Copy chart

Understanding gained on Design Thinking methodology

25 responses



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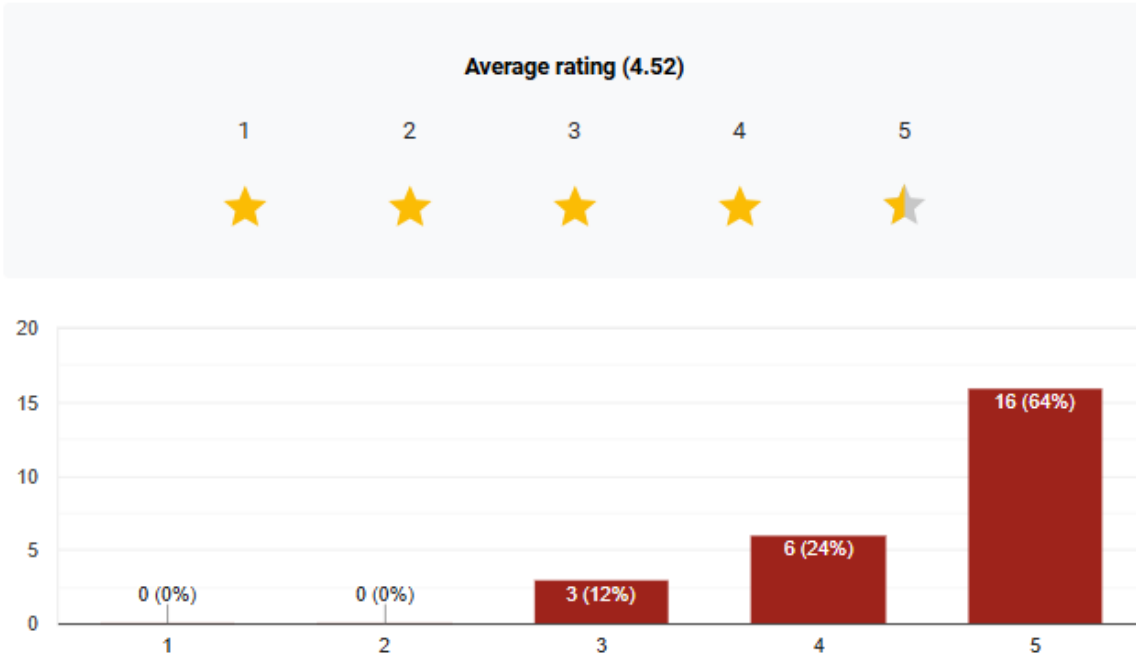
Applicability of Arduino-based experiments to real-world engineering problems.

25 responses

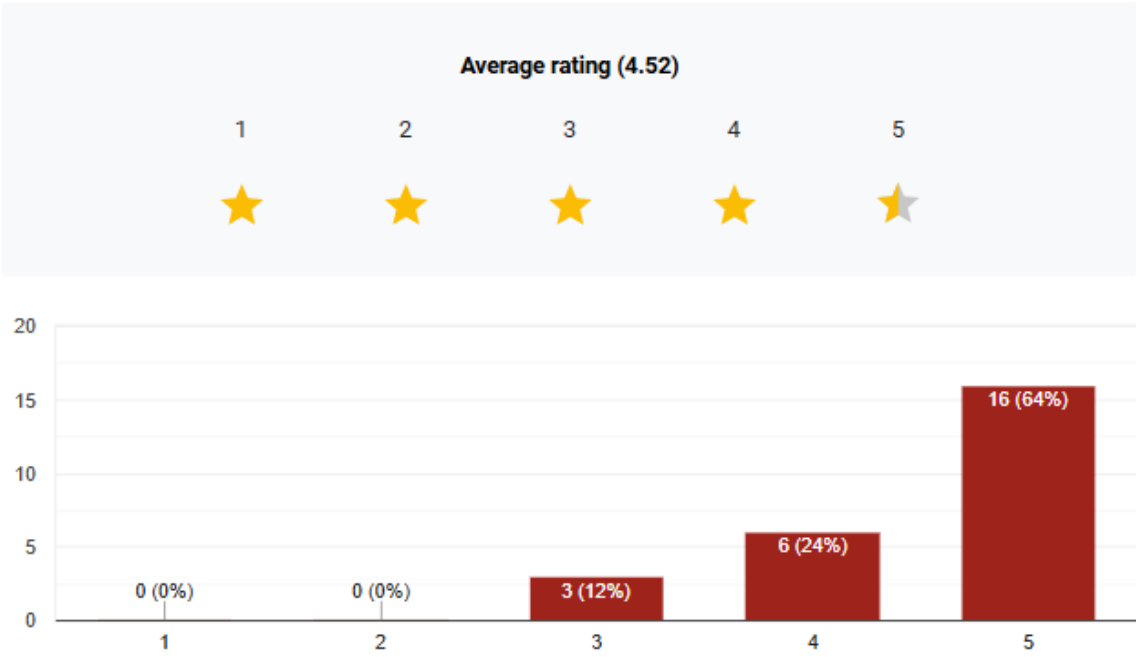


PARTICIPANTS FEEDBACK

Copy chart

Use of innovative teaching aids (Arduino kits, simulations, hands-on activities).

25 responses



Engagement and interaction during sessions

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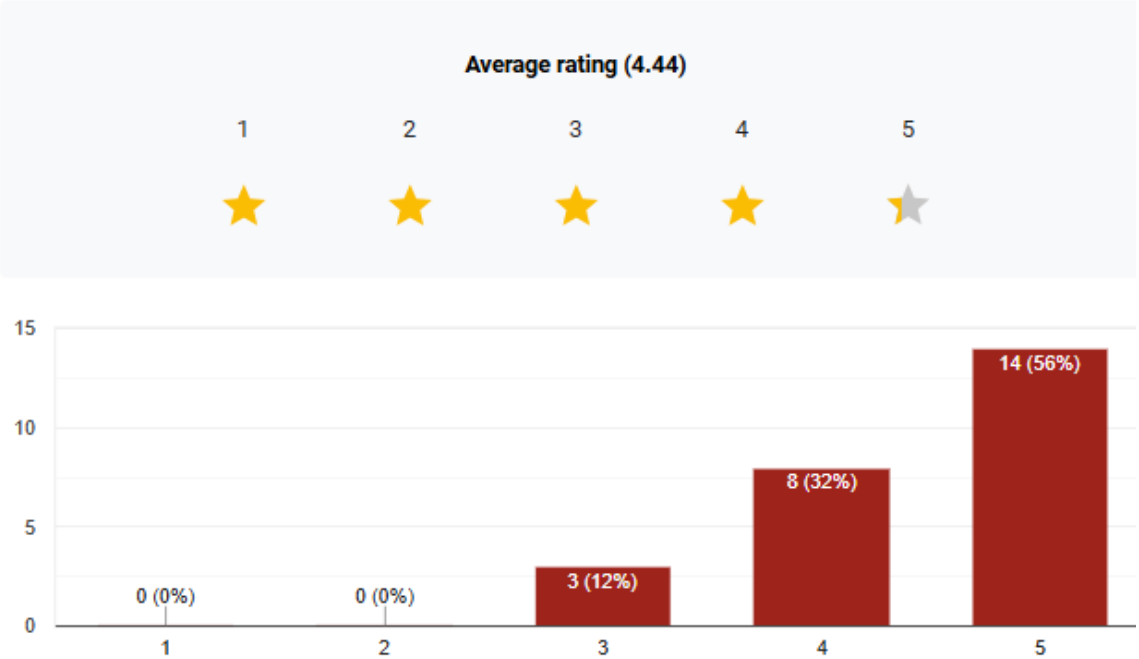
25 responses

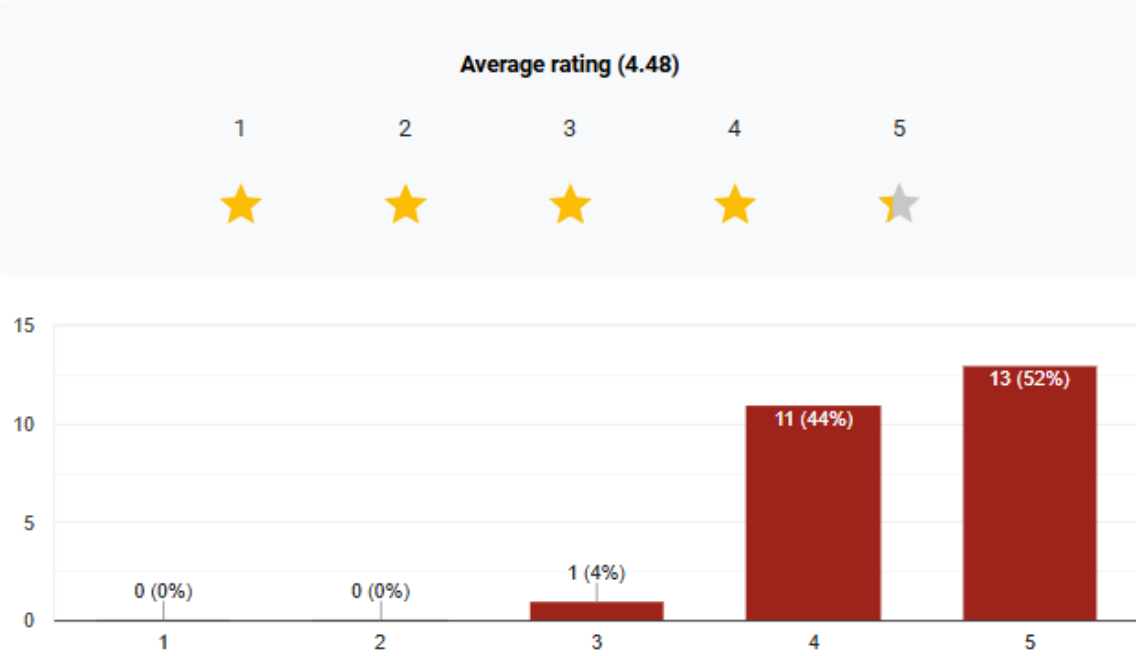


PARTICIPANTS FEEDBACK

Exposure to innovation process from ideation to prototype

Copy chart

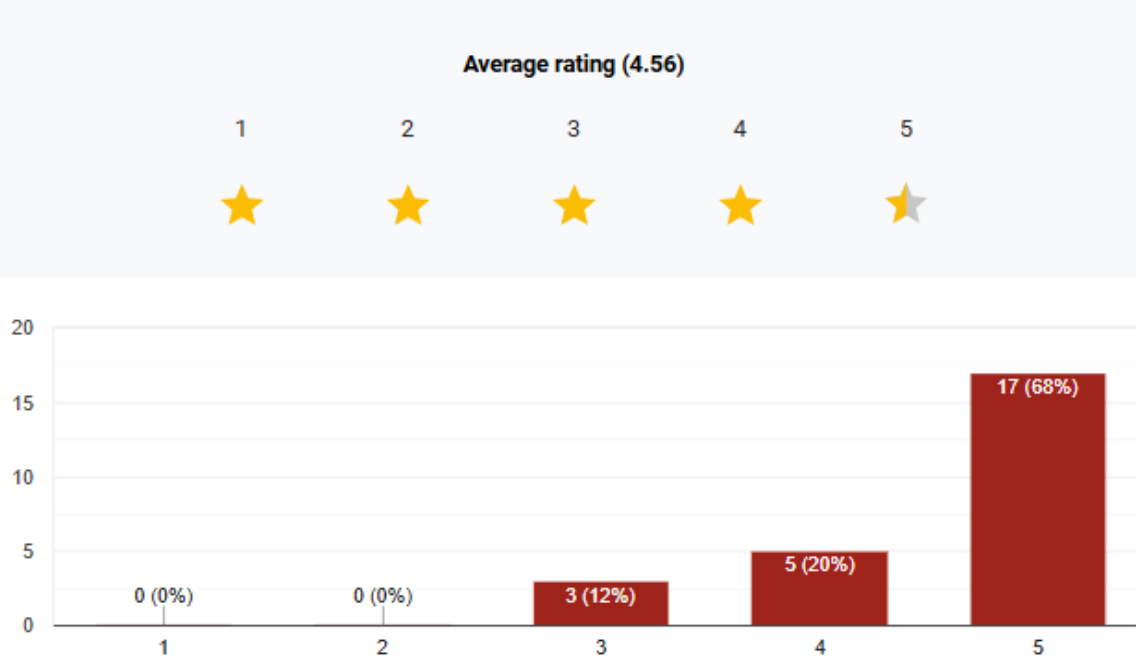
25 responses



Overall usefulness of the workshop in enhancing technical and design skills.

Copy chart

25 responses



PARTICIPANTS FEEDBACK

Suggestions for improvement and additional topics of interest.

25 responses

- More practical can be involved than theory
- Explain with some pictures
- Need more hands on experience.
- Everything was to the level that we expected
- I Am Interest and building a RC with the help of Arduino
- I interested in building RC objects.
- Well understanding and useful to us

PHOTO GALLERY

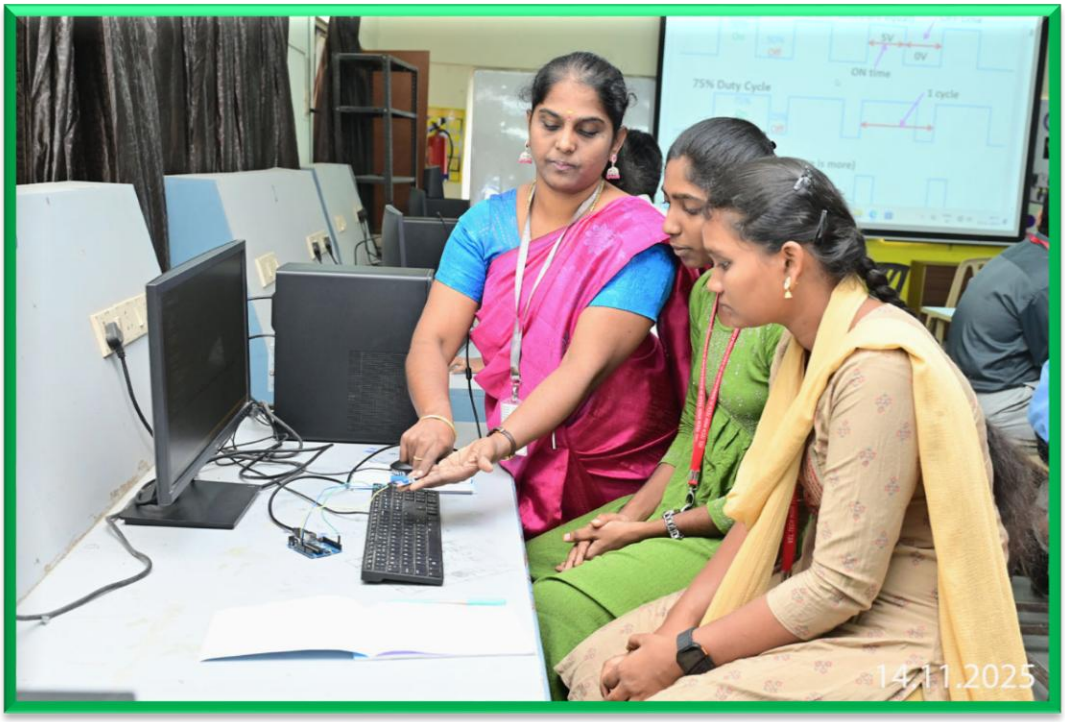


PHOTO GALLERY

PHOTO GALLERY

STUDENT PROJECT

Project Title: Line Following Robot Using Arduino

1. Project Description

A **Line Following Robot** is an autonomous mobile robot designed to detect and follow a visible line drawn on the floor. The line is usually black on a white surface or white on a black surface. The robot uses **infrared (IR) sensors** to detect the line and adjusts its movement accordingly.

This project demonstrates the practical application of **embedded systems, control systems, and robotics**, and is widely used in industrial automation for material handling, path tracking, and warehouse management.

2. Core Components

Component	Specification	Purpose
Arduino Uno	ATmega328P	Main controller for processing sensor data
IR Sensor Modules	TCRT5000 or equivalent	Detects black/white surface
Motor Driver Module	L298N / L293D	Controls motor direction and speed
DC Geared Motors	6V–12V	Drives robot wheels
Robot Chassis	Acrylic/metal base	Mechanical structure
Wheels + Castor Wheel	Standard	Movement and balance
Battery Pack	7.4V / 9V	Power supply
Jumper Wires	Male–Female	Electrical connections
On/Off Switch	–	Power control

3. How It Works (Block-Level Explanation)

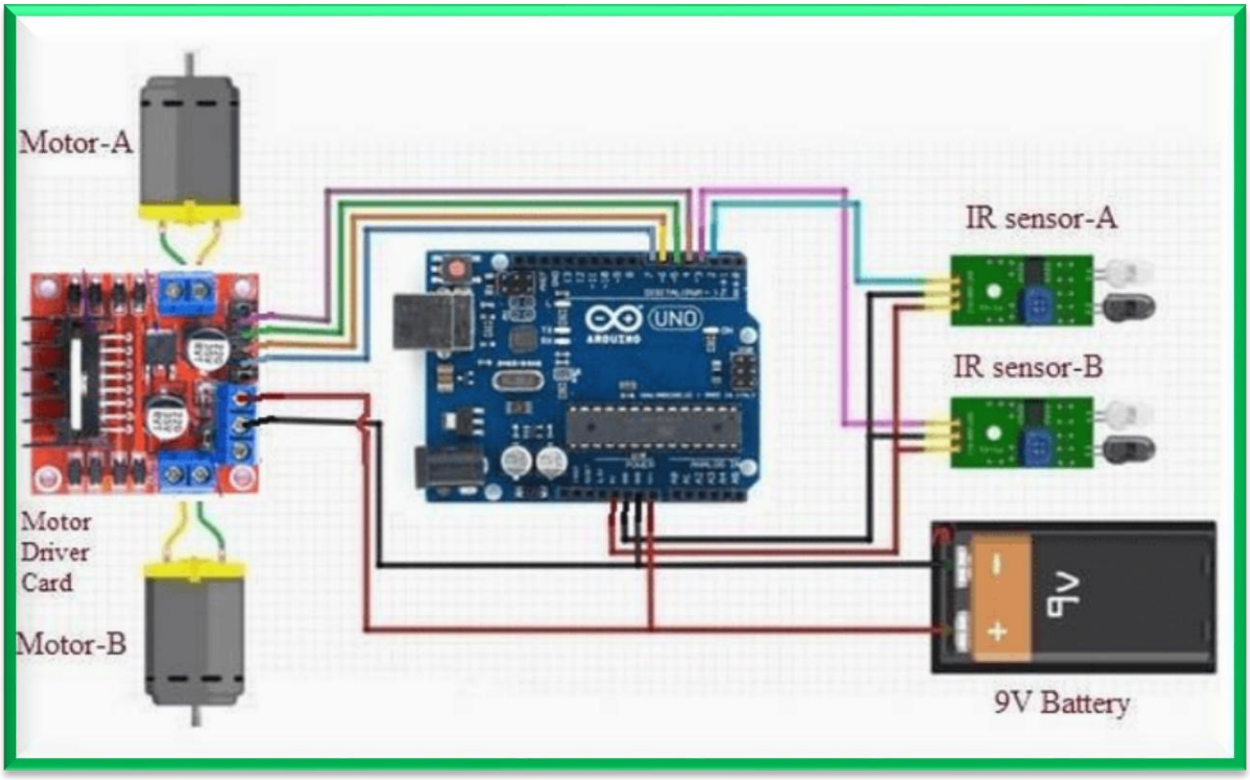
The working principle of a Line Following Robot is based on **light reflection**.

- **IR transmitters** emit infrared light onto the surface.
- **White surface** reflects more light → sensor output is HIGH.
- **Black line** absorbs light → sensor output is LOW.

The Arduino continuously reads sensor outputs and sends commands to the motor driver:

- If the **line is centered** → robot moves forward.
- If the line shifts **left** → robot turns left.
- If the line shifts **right** → robot turns right.

4. Connection Diagram (Text Representation)



IR Sensor Connections:

Left IR Sensor:

VCC → 5V (Arduino)

GND → GND (Arduino)

OUT → Digital Pin 2

Right IR Sensor:

VCC → 5V (Arduino)

GND → GND (Arduino)

OUT → Digital Pin 3

Motor Driver (L298N) Connections:

ENA → Arduino PWM Pin 5

IN1 → Arduino Pin 8

IN2 → Arduino Pin 9

ENB → Arduino PWM Pin 6

IN3 → Arduino Pin 10

IN4 → Arduino Pin 11

Motor A → Left DC Motor

Motor B → Right DC Motor

12V/VMOT → Battery Positive

GND → Battery Negative & Arduino GND (Common Ground)

Power Connection:

Battery (+) → Motor Driver VCC

Battery (–) → GND (Common with Arduino)

5. Working of the Project (Step-by-Step)

1. Power is supplied to the Arduino and motor driver using a battery.
2. The IR sensors continuously scan the surface.
3. Sensor values are read by Arduino.
4. Based on sensor readings:
    - Both sensors on white → Move Forward
    - Left sensor on black → Turn Left
    - Right sensor on black → Turn Right
5. The motor driver receives direction signals and drives the motors accordingly.
6. The robot follows the black line continuously until power is turned off.

6. Program for Line Following Robot (Arduino Code)

```
// Line Following Robot using Arduino

#define LEFT_SENSOR 2
#define RIGHT_SENSOR 3

#define ENA 5
#define IN1 8
#define IN2 9

#define ENB 6
#define IN3 10
```

```
#define IN4 11

int speedMotor = 150;

void setup() {
  pinMode(LEFT_SENSOR, INPUT);
  pinMode(RIGHT_SENSOR, INPUT);

  pinMode(ENA, OUTPUT);
  pinMode(IN1, OUTPUT);
  pinMode(IN2, OUTPUT);

  pinMode(ENB, OUTPUT);
  pinMode(IN3, OUTPUT);
  pinMode(IN4, OUTPUT);
}

void loop() {
  int leftSensor = digitalRead(LEFT_SENSOR);
  int rightSensor = digitalRead(RIGHT_SENSOR);

  if (leftSensor == LOW && rightSensor == LOW) {
    moveForward();
  }
  else if (leftSensor == HIGH && rightSensor == LOW) {
    turnRight();
  }
  else if (leftSensor == LOW && rightSensor == HIGH) {
    turnLeft();
  }
  else {
    stopRobot();
  }
}
void moveForward() {
  analogWrite(ENA, speedMotor);
  analogWrite(ENB, speedMotor);
```

```
  digitalWrite(IN1, HIGH);
  digitalWrite(IN2, LOW);
  digitalWrite(IN3, HIGH);
  digitalWrite(IN4, LOW);
}
void turnLeft() {
  analogWrite(ENA, 80);
  analogWrite(ENB, speedMotor);

  digitalWrite(IN1, LOW);
  digitalWrite(IN2, HIGH);
  digitalWrite(IN3, HIGH);
  digitalWrite(IN4, LOW);
}
void turnRight() {
  analogWrite(ENA, speedMotor);
  analogWrite(ENB, 80);

  digitalWrite(IN1, HIGH);
  digitalWrite(IN2, LOW);
  digitalWrite(IN3, LOW);
  digitalWrite(IN4, HIGH);
}
void stopRobot() {
  digitalWrite(IN1, LOW);
  digitalWrite(IN2, LOW);
  digitalWrite(IN3, LOW);
  digitalWrite(IN4, LOW);
}
```

7. Conclusion

The Line Following Robot project successfully demonstrates the integration of **sensors, microcontroller, and motor control systems**. This project helps students understand real-time control systems and automation concepts. It has practical applications in **industrial transport systems, warehouse robotics, and automated guided vehicles (AGVs).**

EXPENSE STATEMENT

S.NO	ITEM DESCRIPTION	DATE	BILL NO	AMOUNT (Rs)
1	Brochure	11.11.2025	581	108
2	Banner	11.11.2025	19060	500
3	Students Kit	11.11.2025	63003	672
4	Certificate	11.11.2025	588	330
5	Miscellaneous (Battery)	12.11.2025	-	72
6	Report	10.12.2025		
	Total			1682

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CASH BILL

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#13, Rani Nagar, Alamathi Road, Tiruvallur, Chennai - 600062
skyseroxchennai@gmail.com 7339221595 6380477074

GST No. : 33AFBFS4993Q1Z7

XEROX, PRINTS, BINDING, LAMINATION, STATIONARIES

Bill No. 581 Date : 07/11/25
Mr./Ms. Veltech Hightech
Customer GST :

S.No	Qty	Particulars	Rate	Amount
	4	Brouche	23	92
			Amount	92
			SGST 9%	8
			CGST 9%	8
			TOTAL	108

Thank you

V… TECH HIGH TECH
Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE
AN AUTONOMOUS INSTITUTION
IN TIME . 12.45
DATE . 7-11-25
SL NO . 3893
SIGN

…TERIAL RECEIVED
DATE :
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STOCK VERIFIED
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VEL TECH …

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NORTH CAMPUS - INWARD
DATE 7-11-25 TIME 12.50PM
…: mp mo
… NO: DB1/2103
… : Dr. Vijay

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NAME Dr. Vijay
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DATE 7-11-25

Bill No. 19060

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CASH BILL / DC

To. Vel Tech High Tech Date: 4/11/25

S.NO	DESCRIPTION	QTY	RATE/UNIT	AMOUNT
1	6x4 Banner	2	250	500
			TOTAL	500

Advance……

Thank you

Cash mode: ☐ cash ☐ check ☐ card ☐ credit ☑ account transfer

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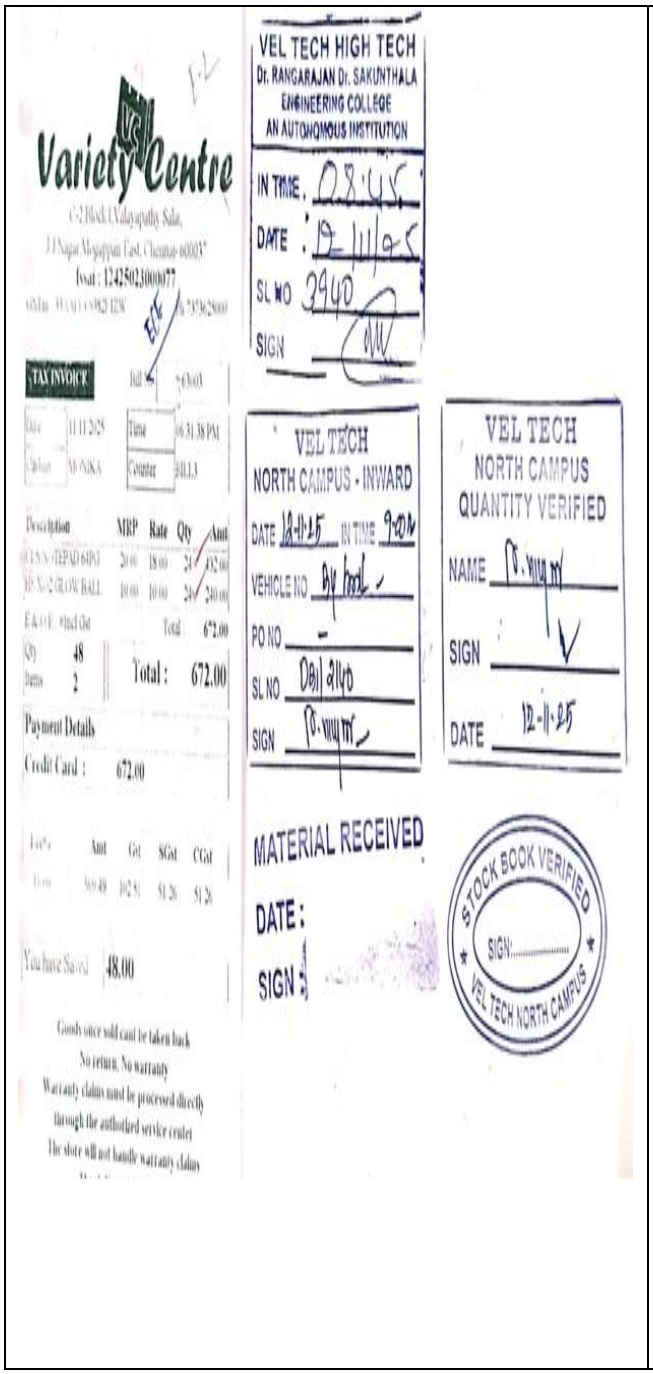

Variety Centre

TAX INVOICE

Total : 672.00

Payment Details

Credit Card : 672.00

You have Saved 48.00

Goods once sold cant be taken back
No return, No warranty
Warranty claims must be processed directly
through the authorized service center
The store will not handle warranty claims

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DATE : 13/11/25
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VEL TECH
NORTH CAMPUS - INWARD
DATE 13-11-25 IN TIME 9:00
VEHICLE NO By hand
PO NO -
SL NO Bill alone
SIGN

VEL TECH
NORTH CAMPUS
QUANTITY VERIFIED
NAME
SIGN
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Bill No. 588 Date : 13/11/25
Mr./Ms. veltech Hightech
Customer GST :

S.No	Qty	Particulars	Rate	Amount
	28	AL Certificate	10	280
			Amount	280
			SGST 9%	25.2
			CGST 9%	25.2
			TOTAL	330.4

SKY XEROX Chennai 600 062

Thank you

VEL TECH HIGH TECH
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IN TIME. 16:20
DATE . 13-11-25
SL NO 3969
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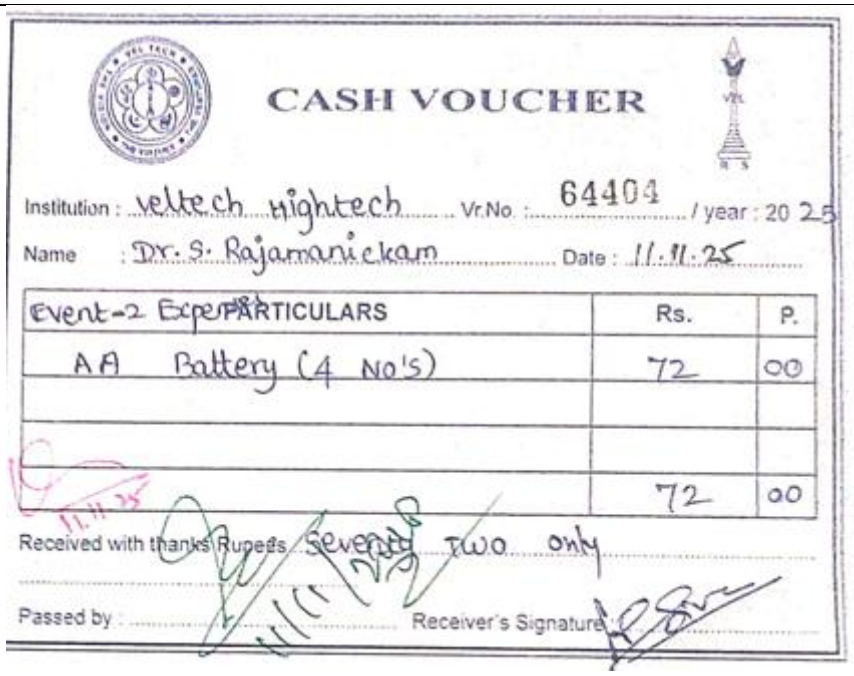

CASH VOUCHER

Institution : veltech hightech Vr.No : 64404 / year : 20 25

Name : Dr. S. Rajamanickam Date : 11.11.25

PARTICULARS	Rs.	P.
Event-2 Exp AA Battery (4 No's)	72	00
	72	00

Received with thanks Rupees Seventy two only

Passed by : Receiver's Signature