केन्द्रीय विद्यालय संगठन

केन्द्रीय विद्यालय संगठन

KENDRIYA VIDYALAYA SANGATHAN

आंचिलक शिक्षाएवं प्रशिक्षण समस्थान,मैसूर

ZONAL INSTITUTE OF EDUCATION AND TRAINING,MYSURU

SKILL ENRICHMENT IN VOCATIONAL EDUCATION PRACTICAL LEARNING WITH ATL AND STEAM For TGT(WE)

16.06.2025 to 20.06.2025

- IoT&Robotics
- Tinker Cad
- Microgreen Farming
- AI
- Arduino Projects
- Scratch Interface
- DIY

COURSE DIRECTOR

Ms. MENAXI JAIN

DEPUTY COMMISSIONER KVS &

DIRECTOR, ZIET MYSURU

ASSOCIATE COURSE DIRECTOR

Mr. G KUMARA MOHAN

PRINCIPAL, PM SHRI KV AFS AKKULAM

RESOURCE PERSONS

Mr. T R SABARIGIREESAN

TGT WE, PM SHRI KV AFS AKKULAM

&

Mrs.JAYASREE C

TGT WE PM SHRI KV PAATOM SHIFT II

COURSE COORDINATOR

D.SREENIVASULU

TRAINING ASSOCIATE(MATHEMATICS)
ZIET MYSURU

DIRECTOR'S MESSAGE

It is with great pleasure that I present the e-Manual for the 5-Day Offline Workshop on "Skill Enrichment in Vocational Education: Practical Learning with ATL & STEAM" designed for TGTs (Work Education). This workshop reflects our continued commitment to fostering skill-based, innovative, and experiential learning in alignment with the goals of the National Education Policy (NEP) 2020 and the National Curriculum Framework for School Education (NCF-SE).

In today's rapidly evolving educational landscape, integrating Vocational Education with platforms like Atal Tinkering Labs (ATL) and STEAM (Science, Technology, Engineering, Arts, and Mathematics) is critical for equipping students with real-world competencies, problem-solving abilities, and a spirit of innovation. This workshop aims to empower Work Education teachers with hands-on tools, interdisciplinary strategies, and practical methodologies to transform classrooms into dynamic spaces of creativity and applied learning.

I extend my heartfelt appreciation to the Associate Course Director, expert Resource Persons, participants, Training Associates, and the Workshop Coordinator for their enthusiastic participation and thoughtful contributions. Their collective efforts have made this initiative a rich and meaningful professional learning experience.

Wishing you all an enriching and transformative journey ahead!

MENAXI JAIN
DIRECTOR
ZIET MYSURU

DETAILS OF PARTICIPANTS- TGT(WE)

S. No.	Name of Teacher	Name of KV	REGION
ACD	G. KUMARA MOHAN	PM SHRI KV AFS AKKULAM	ERNAKULAM
RP	Jayasree C	PM SHRI KV PATTOM (SHIFT II)	ERNAKULAM
RP	T R SABARIGIREESAN	PM SHRI KV AFS AKKULAM	ERNAKULAM
1	P P LIJINA	PM SHRI KV NO.2 KASARAGOD	ERNAKULAM
2	Venugopalan P V	PM SHRI KV INS ZAMORIN,EZHIMALA	ERNAKULAM
3	B Murugesh Kumar	PM SHRI KV KELTRON NAGAR	ERNAKULAM
4	Vinod Kumar K K	PM SHRI KV KANNUR	ERNAKULAM
5	Dumpala Pushpalatha	PM SHRI KV KALPETTA	ERNAKULAM
6	SINDU N	PM SHRI KV NO.I CALICUT	ERNAKULAM
7	SHYJA O	PM SHRI KV NO.2CALICUT	ERNAKULAM
8	Saleem K	PM SHRI KV MALAPPURAM	ERNAKULAM
9	PREETI PANDEY	PM SHRI KV No.1 PALAKKAD	ERNAKULAM
10	Sheeja C J	PM SHRI KV KANJIKODE	ERNAKULAM
11	CIGY PAUL	PM SHRI KV THRISSUR	ERNAKULAM
12	BINESH MN	PM SHRI KV ERNAKULAM	ERNAKULAM
13	SREEJA K	PM SHRI KV No.1 NAVAL BASE KOCHI	ERNAKULAM
14	SOUMIYA K S	PM SHRI KV No.2 NAVAL BASE KOCHI	ERNAKULAM
15	C V SHINE	PM SHRI KV PORT TRUST	ERNAKULAM
16	SANTHOSH N SHIVAMMANAVAR	PM SHRI KV IDUKKI	ERNAKULAM
17	SHEELA AJAY	KV KADUTHURUTHY	ERNAKULAM
18	JAISON AUGUSTINE	PM SHRI KV RB KOTTAYAM	ERNAKULAM
19	BHAVAPRIYA C B	KV NTPC KAYAMKULAM	ERNAKULAM
20	Krishnan K V	PM SHRI KV ADOOR(SHIFT I)	ERNAKULAM
21	SARGI B J	PM SHRI KV ADOOR(SHIFT II)	ERNAKULAM
22	P G MATHEW	PM SHRI KV KOLLAM	ERNAKULAM
23	T A JOIY	PM SHRI KV CRPF PALLIPURAM	ERNAKULAM
24	Swathy K C	PM SHRI KV PATTOM (SHIFT I)	ERNAKULAM
25	Resmy R S	PM SHRI KV PANGODE	ERNAKULAM
26	KASMEERA K S	PM SHRI KV SAP PEROORKADA	ERNAKULAM
27	SAMBHU D	PM SHRI KV KAVARATTI	ERNAKULAM
28	Mrs. AS RAMYA	PM SHRI KV KPA RAMAVARMAPURAM	ERNAKULAM

GROUPS

S. No.	NAME OF THE OFFICER	PHOTO
	GROUP - 1	
1	SWATHY K C	
2	P P LIJINA	
3	B MURUGESH KUMAR	
4	SHEEJA C J	
5	JAISON AUGUSTINE	
6	MRS. AS RAMYA	
	GROUP - 2	
1	SREEJA K	
2	VENUGOPALAN P V	
3	PREETI PANDEY	
4	SHEELA AJAY	
5	P G MATHEW	
	GROUP - 3	
1	VINOD KUMAR K K	
2	SALEEM K	
3	CIGY PAUL	
4	SANTHOSH N SHIVAMMANAVAR	
5	T A JOIY	
6	KASMEERA K S	

GROUP - 4		
1	SAMBHU D	
2	DUMPALA PUSHPALATHA	
3	SOUMIYA K S	
4	C V SHINE	
5	SARGI B J	
6	RESMY R S	
GROUP - 5		
1	BINESH MN	
2	SINDU N	
3	SHYJA O	
4	BHAVAPRIYA C B	
5	KRISHNAN K V	

TIME TABLE

DATE	9.00-9.45 am	9.45 am -11.15 am		11.30am -1.00 pm		2.00 pm-3.30 pm		3.45 pm -5.30 pm
16.06.2025	Inauguration	Understanding Vocational Skills for Work Education, Importance of vocational skills in Modern education, Overview of key vocational areas- By T.R.Sabarigireesan , RP	Tea Break 11.15 am-11.30 am	Introduction to simple circuit and basic Electrical Quantities through tinkercad- By Mrs.Jayasree C, RP	Lunch Break 1.00 pm-2.00 pm	Introduction to Arduino- By T.R.Sabarigireesan , RP	Tea Break 3.30 pm-3.45 pm	Coding of Arduino- By Sambhu D
17.06.2025	Assembly	Plant Nursery and Microgreen farming - By Mrs.Jayasree C, RP		Automatic Light Sensor using Arduino and LDR- By T.R.Sabarigireesan		Introduction to Scratch and developing a game - By Mr.Binesh M N		Group wise project - Hands on session
18.06.2025	Assembly	Component based LED Light Servicing and its relevance- Mrs.Jayasree C, RP		Paper pen making - By T.R.Sabarigireesan, RP		Basics of Robotics - by Think Pro academy		Hands on Activities - Robotics - by Think Pro academy
19.06.2025	Assembly	Weather Station using Arduino - By T.R.Sabarigireesan, RP		ATL VISIT		IOT , its applications, Simulation softwares- D PUSHPALATHA & Group, Face recognition using machine learning and Scratch by Smt. Kashmira		STEAM integated with Vocational Education, by Mrs.Cigy Paul, "The Small Stellated Dodecahedron"/Group project-Hands on Activities
20.06.2025	Assembly	Adaptive Brightness control using AI by Sambhu D/ Arduino base PIR Door/ Light Switching T.R.Sabarigireesan, RP		Presentation of Group wise projects		Discussion on General concerns on Vocational Education implementation connecting ATL and STEAM, based on NCERT Activity book by Associate Course Director, Shri. Kumaramohan G		Closing Session

DAY WISE REPORTS

DAY 1:16.06.2025

The five-day workshop on *"Skill Enrichment in Vocational Education: Practical Thinking with ATL and STEAM"* commenced on 16th June 2025 at ZIET Mysuru with great enthusiasm and purpose. The workshop is designed to enhance the skills and competencies of Work Education (WE) teachers in alignment with the vision of the National Education Policy (NEP) 2020.

The day began with a welcome address by Mr. D. Srinivasulu, Training Assistant (Mathematics), who warmly greeted the participants and provided essential instructions regarding the structure and schedule of the workshop.

This was followed by an inspiring address by Mr. Kumara Mohan G, Associate Course Director and Principal, PM SHRI KV AFS Akkulam. He gave a comprehensive overview of the workshop's objectives and emphasized the importance of empowering Work Education teachers with practical tools and methodologies for delivering effective vocational education. He highlighted the key goals of the program, including introducing teachers to Atal Tinkering Labs (ATL) and STEAM (Science, Technology, Engineering, Arts, and Mathematics) education, as well as promoting project-based learning. He stressed the significance of 21st-century skills such as critical thinking, collaboration, creativity, and digital literacy, while also elaborating on concepts like design thinking and creative pedagogy. He clarified the distinction between competency development and skill development, underlining their relevance in real-world contexts.

The workshop was further enriched by the presence of Ms. Menaxi Jain, Deputy Commissioner and Director of ZIET Mysuru, and Course Director of the program. In her keynote address, she emphasized the pivotal role of vocational education in shaping the future of school education in India. She highlighted that vocational training is not an additional subject but an integral part of holistic education that equips students with life and career skills. Citing NEP 2020, she underscored the importance of early vocational exposure to nurture self-reliant, adaptable, and future-ready learners.

Ms. Jain further pointed out that Work Education teachers act as a bridge between theory and practice, bringing real-world relevance into classrooms. She passionately advocated for nurturing practical intelligence alongside academic knowledge, stressing that students should not only grasp concepts but also apply them meaningfully. She highlighted how vocational education

fosters dignity of labour, encourages entrepreneurial thinking, and prepares students for diverse career opportunities, including those in the informal sector and emerging industries.

She also shared that the workshop is part of a long-term professional development journey, with follow-up sessions and online reflective practices planned after the onsite training. Progress reviews will be conducted to monitor implementation at the school level and provide continued mentorship. Her forward-looking vision aims to build a vibrant community of Work Education teachers who are confident, competent, and capable of leading skill-development initiatives in schools. She concluded with a motivating call to action, urging participants to learn, implement, and advocate for vocational education with passion and purpose.

The first technical session of the day was conducted by Mr. T. R. Sabarigireesan, TGT (Work Education), PM SHRI KV AFS Akkulam, who is also a resource person for the course. He introduced vocational skills for Work Education classes from VI to XII, as envisaged in NEP 2020. He explained how vocational education enhances students' employability and entrepreneurial abilities, sharing practical strategies such as research-based assignments, video learning, and community partnerships with local industries. These approaches make vocational education inclusive, engaging, and meaningful.

The second session was led by Mrs. Jayasree C, TGT (Work Education), PM SHRI KV Pattom (Shift II). Her session focused on sparking curiosity in students and teaching basic electrical concepts. Using real-life analogies, she explained electrical quantities and introduced participants to *Tinkercad*, a free online tool for circuit design and simulation. Teachers engaged in hands-on practice, creating simple circuits with LEDs, resistors, and batteries. The session was highly interactive and showcased how such tools can enrich classroom learning.

In the third session, Mr. T. R. Sabarigireesan introduced the Arduino Uno microcontroller, widely used in educational projects. He explained its pin diagram and demonstrated how to build a blinking LED circuit using block coding in Tinkercad. He also guided participants in designing a manual traffic signal system with a slide switch. A brainstorming activity challenged participants to design a four-way traffic light system using red, green, and orange LEDs—encouraging collaboration and critical thinking.

The final session was conducted by Mr. Shambu D, TGT (Work Education), KV Kavaratti, who focused on basic Arduino programming using C language. He introduced fundamental commands and guided participants through coding exercises in Tinkercad. Teachers created circuits with LEDs and pushbuttons while learning debugging techniques. This session built

participants' confidence in coding and using microcontrollers, preparing them to introduce technology-driven projects to their students.

The first day concluded with active participation and enthusiastic engagement, setting a strong foundation for an enriching and transformative learning experience in the days ahead.

DAY 2:17.06.2025

The second day of the training programme began with a vibrant and well-coordinated morning assembly conducted by Group I members. The programme was anchored by Ms. Swathy K. C, who efficiently guided the sequence of events, introducing speakers and ensuring a smooth flow throughout.

The assembly commenced with the Pledge, led by Mr. Murugesan, followed by a Thought for the Day presented by Mrs. Sheeja, which set a reflective tone. Mr. Jaison shared the news updates, keeping participants informed on current affairs. A special presentation on the World Day to Combat Desertification and Drought was delivered by Mrs. Lijina P. P, highlighting environmental concerns related to land degradation and drought. Mrs. Ramya then presented a concise and informative report on the previous day's activities, capturing the essence of the sessions and key observations.

After the assembly, Mr. D. Sreenivasulu addressed the gathering. He appreciated the dedication and enthusiasm of the Vocational Education (WE) teachers, particularly their efforts in integrating technology into practical learning. He introduced the schedule for the day and acknowledged the active participation of all members. He then invited Deputy Commissioner Ms. Menaxi Jain to deliver a motivational talk.

In her address, Ms. Menaxi Jain emphasized the urgent need to protect nature and preserve natural resources. Reflecting on the lessons learned from the sessions so far, she encouraged participants to apply them in both personal and professional contexts. She highlighted the importance of healthy eating habits, drawing attention to the message of *POSHAN MAAH*, and urged educators to spread awareness among students and parents about avoiding junk and fast food. She further underlined the significance of life skills development, describing them as essential for lifelong learning, and encouraged teachers to consciously nurture these skills in their classrooms.

The academic sessions began with Mrs. Jayasree C, who delivered an insightful presentation on plant nurseries and soilless green gram microgreen farming. She introduced participants to

different types of nurseries, their role in promoting sustainable living, and their potential for entrepreneurship development. She discussed the stages of plant growth—from seed to tree—and highlighted innovations such as greenhouse structures, potting machines, irrigation systems, and storage methods. The session also emphasized technology-driven agriculture, the dignity of labour, and the preservation of native plant species.

The session was further enriched by Mr. G. Kumara Mohan, Associate Course Director, who shared practical suggestions and examples from the field. He encouraged discussions, enabling teachers to share their experiences and clarify doubts related to seedless plants, microgreens, and nursery farming. This interactive exchange deepened participants' understanding of innovative agricultural practices.

This was followed by a hands-on session led by Mr. T. R. Sabarigireesan, who introduced the concept of automation using Arduino. He demonstrated how to build an automatic night lamp using an LDR (Light Dependent Resistor), resistors, and an LED bulb, connecting the components to the Arduino board through GND, 5V, and A0 pins. Participants observed the functioning of the circuit using simulation tools and understood how the lamp switches on and off based on surrounding light levels. He also explained and simulated a traffic light signal model. Participants actively engaged in building and simulating their own circuits, gaining real-time exposure to the basics of electronics and automation.

Post-lunch, the final session was conducted by Mr. Binesh M. N, who introduced participants to game development and animation using the SCRATCH platform. He explained the basics of block-based programming, enabling participants to create simple interactive programs. Under his guidance, participants developed a game where an apple falls into a bowl, and the score increases when the apple is caught. Upon reaching a score of ten, a "WIN" message appeared on the screen. Through this activity, participants were introduced to programming concepts such as loops, conditions, variables, and event handling in a visually engaging and beginner-friendly format.

The second day concluded with a sense of accomplishment and excitement among participants. The sessions successfully integrated the themes of sustainability, technology, creativity, and life skills, providing meaningful insights and practical experiences. Each session contributed to enriching the vocational training journey and encouraged participants to adopt innovative practices in their classrooms.

DAY 3:18.06.2025

The third day of the workshop began with a vibrant and well-orchestrated morning assembly, gracefully led by Group 2 under the guidance of Mr. Mathew. The programme included the soulful KVS prayer, the national pledge led by Mrs. Sreeja, an insightful "Thought for the Day" by Mrs. Preeti, and the latest news updates presented by Mr. Mathew. A special highlight was the segment on International Picnic Day, delivered by Mr. Venugopal, who emphasized the importance of relaxation and bonding through picnics and introduced popular tourist destinations around Mysuru. The Day 2 report, presented by Mrs. Sheela Ajay, brought the assembly to a thoughtful conclusion.

Following the assembly, Mr. D. Sreenivasulu, Course Coordinator, introduced the day's four sessions. Shortly after, Ms. Menaxi Jain, Deputy Commissioner and Director of ZIET Mysuru, addressed the gathering. She revisited key learnings from the previous day and presented a visionary idea: encouraging teachers to repurpose discarded materials such as tiles, stones, wood, and metal to create sustainable school gardens. She emphasized that with creativity and resourcefulness, limitations of space or budget can be overcome. She also highlighted the need to thoroughly study the Class VI and VII Vocational Education textbooks to fully grasp the intent of the curriculum. Adding depth to her vision, Mr. T. A. Joiy, Mrs. Sreeja, and Mrs. Cigy Paul shared real-life examples of transforming green waste and discarded materials into valuable garden resources in their schools. Ms. Jain further encouraged teachers to implement the automatic lighting solutions introduced on Day 2 as a contribution to national energy conservation.

The first academic session was conducted by Mrs. Jayasree C, titled *"Empowering Sustainable LED Servicing."* She emphasized how repairing, rather than discarding, damaged LED lights fosters sustainability and imparts valuable skills to students. The session covered:

- Basics of LED technology and safety
- Component identification
- Diagnosis and repair techniques
- Soldering and desoldering methods
- Final testing and validation

Mr. G. Kumara Mohan, Associate Course Director, reinforced the significance of the 4Rs—*Reduce, Reuse, Recycle, and Repair*—as essential elements of India's Vision 2047 and encouraged integrating them into classroom learning. The second half of the session focused on practical troubleshooting, with Mr. Krishnan, Mr. Venugopalan, Mrs. Lijina, and Mr. Mathew sharing their hands-on experiences. Mrs. Cigy Paul also shared her inspiring story of implementing zero-cost LED repairs in her school. The session concluded with Mr. Kumara Mohan urging teachers to align workshop learnings with the Class VII textbook content.

The second session, led by Mr. T. R. Sabarigireesan, explored creativity through *Paper Pen Making and Front-Page Design*. In the first part, participants recycled waste paper into eco-friendly pens, promoting sustainability and hands-on learning. The second part introduced simple 3D calligraphy and binding techniques for designing attractive cover pages. The lively, interactive session combined environmental awareness with artistic expression, and every participant successfully crafted paper pens and project covers.

The third session was facilitated by ThinkPro Academy (STEMPro Solutions). Mr. Sunil Joshi, Director and Co-founder, along with team members Mr. Shaktivel and Mr. Suhas, guided participants through hands-on STEM projects such as:

- Parking Buzzer
- Smart Street Light
- Theft Alarm

Teachers also explored an in-house programming application to build an obstacle-detection project with a real-time distance display. This session encouraged collaboration, critical thinking, and technological curiosity.

The day concluded with a Bookmaking Workshop led by Mr. Sabarigireesan. Participants enthusiastically followed step-by-step guidance to create handmade notebooks. Beyond being a practical skill, the activity instilled creativity, mindfulness, and a sense of craftsmanship—qualities essential to both teaching and learning.

Day 3 ended on a high note, with participants gaining practical skills, creative insights, and innovative approaches that can be meaningfully applied in classrooms.

DAY 4 :19.06.2025

The session commenced with an introduction by Mrs. Kashmeera, who warmly welcomed all the participants. Following this, the Kendriya Vidyalaya Sangathan (KVS) prayer was recited in unison. The pledge was administered by Mrs. Cigy Paul, the thought for the day was presented by Mr. Santhosh N. Shivammanavar, the news was read by Mr. Saleem K., and Mr. T. A. Joiy presented a special item on *"AI in the Field of Education to Address New Challenges."* The report of the third day was presented by Mr. Vinodkumar K. K.

After the morning assembly, Ms. Menaxi Jain, Director of the course, delivered a thought-provoking talk on waste management, emphasizing the urgent need for sustainable practices in communities and educational institutions. She shared examples of Japan's excellence in this field, highlighting their disciplined segregation systems, community participation, and strong commitment to environmental responsibility. She stressed the importance of empowering students and parents to take active roles in managing waste and promoting eco-friendly habits. Ms. Jain also encouraged educators to devise innovative methods to raise awareness and implement effective strategies within schools and beyond.

Session 1: DHT11 Sensor – *Mr. T. R. Sabarigireesan*

The first technical session was conducted by Mr. Sabarigireesan, who delivered a detailed talk on the DHT11 sensor, covering its working principle (temperature and humidity measurement), technical specifications, and practical advantages. To reinforce learning, participants engaged in a hands-on activity to build a mini weather station using Arduino and the DHT11 sensor. This enabled them to collect and read real-time data, gaining valuable experience in sensor integration and data display. The session was highly interactive, with enthusiastic participation from all attendees.

After the tea break, the participants visited PM SHRI KV Mysuru for a campus tour and to explore the Atal Tinkering Lab (ATL).

Session 2: IoT and Real-Time Device Control – *Mrs. D. Pushpalatha*

In the afternoon, Mrs. D. Pushpalatha introduced participants to the fascinating world of the Internet of Things (IoT). She explained IoT as a network of interconnected devices that collect and exchange data in real time. The session focused on:

- Real-time device control using the ESP32 microcontroller

- WOKWI simulator
- Integration with ThingSpeak, a cloud platform for IoT data logging and visualization
- Practical applications of IoT in daily life

Through demonstrations and hands-on practice, participants learned to monitor and control devices remotely using Wi-Fi-enabled microcontrollers and cloud services. They successfully monitored the temperature and humidity of a city from another location, which generated lively interest and excitement.

Session 3: Face Recognition Using ML & Scratch – *Mrs. Kashmeera K. S.*

Mrs. Kashmeera K. S. presented a beginner-friendly session on Face Recognition using Machine Learning (ML) integrated with Scratch. She introduced the basics of machine learning and its use in identifying facial features and patterns. Using a Scratch extension with ML capabilities, she demonstrated face recognition models in a simple and engaging way. The hands-on activity encouraged enthusiastic participation, making complex concepts accessible to beginners.

Session 4: Small Stellated Dodecahedron – *Mrs. Cigy Paul*

The final session, conducted by Mrs. Cigy Paul, explored the construction of a small stellated dodecahedron. She began by explaining the dodecahedron—a three-dimensional solid with 12 pentagonal faces, 20 vertices, and 30 edges—one of the five Platonic solids. She then introduced the more intricate small stellated dodecahedron, created by extending the faces of a regular dodecahedron into star-like points.

Mrs. Paul demonstrated the step-by-step construction process, making it accessible to all. She discussed its significance in Vaastu Shastra, its influence on architectural design, and its mathematical relevance in symmetry, angles, and polyhedral theory. This session beautifully integrated art, culture, and STEM, leaving participants inspired to view geometry in a fresh and creative light.

The day concluded with participants working on projects in preparation for the final day’s display.

DAY 5 :20.06.2025

The day commenced with the Morning Assembly Prayer, conducted by Group 4, which comprised six participants. The session was compered by Mrs. Soumya of PM Shri KV No. 2, Kochi. The Pledge was administered by Mr. C. V. Shine of PM Shri KV Port Trust, Cochin, and the Thought of the Day was shared by Mr. Sambhu of PM Shri KV Kavaratti.

The segment on World News Around Us was presented by Mrs. Pushpalatha of PM Shri KV Kalpetta, offering participants a concise and informative overview of national and international events. Following this, a special programme on Yoga was conducted by Mrs. Sargi of PM Shri KV Adoor, 2nd Shift. The session highlighted the physical, mental, and emotional benefits of yoga, demonstrating practical techniques and emphasizing its significance for overall well-being. Subsequently, Mrs. Reshmi of PM Shri KV Pangode delivered the report on the fourth-day activities, providing a summary of outcomes and learnings from previous sessions.

Ms. Menaxi Jain, Honourable Director of ZIET Mysuru, addressed the participants with an inspiring message on the responsible implementation of Artificial Intelligence (AI) in education. She emphasized the importance of using AI ethically and responsibly, cautioning against misuse. Ms. Jain also highlighted the potential rights AI systems may acquire in the next five to ten years and introduced the concept of reverse mentoring, where students or junior educators can guide experienced teachers in emerging technologies. During this session, Mr. Krishnan from KV appreciated Mrs. Pushpalatha D for her insightful session on IoT applications using Real-Time Temperature and Humidity Sensors, recognizing her effective hands-on demonstration.

Session 1: AI Assistant on Adaptive Brightness Control Using Machine Learning

The first technical session was conducted by Mr. Sambhu, focusing on the development and application of an AI Assistant for Adaptive Brightness Control. The session provided participants with insightful knowledge on how artificial intelligence and machine learning can be leveraged to create smart, user-adaptive technologies.

The session began with an overview of the limitations of traditional brightness control systems and the growing need for intelligent, responsive solutions. Mr. Sambhu explained how machine learning algorithms can be trained using user behavior data, ambient light sensor readings, time of day, and usage patterns to automatically and accurately adjust screen brightness.

The role of the AI assistant was emphasized: it not only automates adjustments but also learns individual user preferences over time, thereby enhancing comfort and reducing energy consumption. Participants also discussed practical applications of AI in educational technology, smart devices, and real-life settings, ensuring a holistic understanding of both theoretical concepts and hands-on implementation.

Session 2: Project Presentations and Prototype Exhibition

The second session was dedicated to project presentations and a prototype exhibition, showcasing the outcomes of participants' work during the five-day workshop. Each group presented their innovative projects, which included themes such as automation, programming, IoT, animation, and vocational applications.

The exhibition served as a platform for collaborative learning, peer feedback, and demonstration of technical skills. Participants displayed working models and functional prototypes, explaining the concepts and processes involved in their creation.

Ms. Menaxi Jain, Director, ZIET Mysuru, observed the presentations and interacted with participants, providing constructive feedback and appreciating their practical implementation of workshop concepts. The session highlighted the successful integration of theoretical knowledge with practical skills, reflecting the core objectives of the workshop and the hands-on learning achieved.

Session 3: Effective Implementation of Vocational Education

The third session was conducted by Mr. G. Kumara Mohan, focusing on the effective integration of vocational education with Atal Tinkering Labs (ATL) and STEAM (Science, Technology, Engineering, Arts, and Mathematics) methodologies.

Key points covered included:

- Defining learning objectives aligned with vocational outcomes
- Preparing lesson plans that connect theoretical knowledge with hands-on skills
- Implementing assessment strategies to measure both knowledge and practical competency

Participants were given opportunities to learn from the best practices shared by experienced teachers, fostering collaborative learning and knowledge exchange. Notable contributions included:

- Mr. Krishnan (KV Adoor): Strategies to enhance vocational education using ATL tools to promote innovation
- Mrs. Reshmi (KV Pangode): Community-based learning initiatives and student-led projects
- Ms. Jayasree (KV Pattom): Integration of local resources and skills into vocational lessons to increase relevance and engagement

The session was practical, engaging, and well-structured, providing participants with clear guidance on implementing skill-oriented teaching approaches. Teachers were encouraged to adopt innovative, hands-on, and integrated methods to enhance student learning and vocational skill development.

SESSIONS

VOCATIONAL SKILLS FOR WORK EDUCATION: CBSE CLASS 6–12 (NEP 2020)

Mr. T R SABARIGIREESAN
TGT(WE)
PM SHRI KV AFS AKKULAM

Introduction

Vocational education plays a pivotal role in preparing students for the dynamic demands of the modern workforce. Unlike traditional academic learning, which primarily focuses on theoretical knowledge, vocational education equips students with practical skills that enhance employability, promote self-reliance, and foster creative problem-solving. By integrating vocational skills into the school curriculum, students gain hands-on experience that prepares them for both immediate job opportunities and long-term career development.

The National Education Policy (NEP) 2020 emphasizes the importance of vocational education, advocating for its integration into the mainstream curriculum for Classes 6–12. This approach ensures that students not only acquire academic knowledge but also develop practical competencies essential for real-world applications.

Why Vocational Skills Matter

1. Employability
   Vocational training provides students with tangible skills that directly translate into job opportunities. Through practical exposure, students learn to apply theoretical knowledge in real-world scenarios, making them more competitive in the workforce.
2. Self-Reliance
   Hands-on vocational training promotes independence and encourages entrepreneurial thinking. Students learn to manage tasks, plan projects, and develop solutions independently, fostering confidence and resilience.
3. NEP 2020 Integration
   The inclusion of vocational education in NEP 2020 ensures that students from Grades 6–12 receive structured, skill-based learning alongside academics, bridging the gap between classroom knowledge and employable skills.

Vocational Learning by Grade Level

Classes 6–8:
Younger students are introduced to foundational vocational skills through engaging, interactive activities that spark curiosity and creativity. Examples include:

- Carpentry Fundamentals: Building simple wooden frames using age-appropriate tools; developing skills in measurement, planning, and construction.

- Gardening Techniques: Planting seeds in small pots, monitoring growth, and learning basic agricultural practices and plant care.
- Basic Electronics: Connecting LEDs with batteries and switches; understanding electrical circuits through experimentation.

Classes 9–12:
Older students progress to pre-vocational and career-oriented skills, which prepare them for higher education and the job market. Focus areas include:

- Information Technology: Coding basic webpages, developing digital literacy, and exploring IT applications.
- Agriculture: Learning modern farming techniques and sustainable practices.
- Retail Operations: Simulating inventory management, customer service, and sales processes.
- Healthcare Basics: Practicing first-aid techniques, understanding hygiene, and applying basic health protocols.

Practical Skill Development Activities

Carpentry:
Students construct simple wooden frames, learning measurement, material handling, and step-by-step construction processes.

Gardening:
Students engage in hands-on planting activities, understanding soil preparation, watering schedules, and growth monitoring, fostering responsibility and environmental awareness.

Electronics:
Through circuits involving LEDs, batteries, and switches, students explore fundamental principles of electricity and electronics, developing critical thinking and problem-solving skills.

Building Career Skills (Classes 9–12):

- Information Technology: Students create webpages, practice coding logic, and explore digital tools.
- Agriculture: Techniques such as organic farming, crop rotation, and water conservation are introduced.
- Retail Operations: Participants simulate real-world scenarios involving sales, stock management, and customer interaction.
- Healthcare Basics: Students practice practical first-aid measures, emphasizing safety and emergency preparedness.

NEP 2020 in Action at Kendriya Vidyalaya

Kendriya Vidyalayas have implemented vocational education with a focus on locally relevant skills:

- Resources: Teachers use CBSE skill modules and participate in specialized training sessions.
- Curricular Integration: NEP 2020 mandates 50% vocational exposure and includes 10 bagless days for experiential learning, allowing students to practice hands-on skills beyond traditional classroom activities.

Measuring Success

Effective vocational education relies on systematic assessment, which includes:

- Observation: Teachers monitor participation, engagement, and skill application during hands-on activities.
- Worksheets: Students reflect on their experiences and record observations to reinforce learning.
- Demonstrations: Students showcase proficiency by performing tasks or presenting projects.
- Reflection: Class discussions help students consider the future application of skills and develop problem-solving abilities.

Ensuring Safe Learning

Safety is a cornerstone of vocational education:

- Age-Appropriate Tools: Younger students use plastic or simplified tools, while older students receive proper training for standard equipment.
- Supervision: Teachers maintain close monitoring during all practical activities.
- Preparation: Materials are arranged in advance, and safety protocols are reviewed before each session begins.

Empowering Students with Vocational Skills

1. Skill Development: Students gain marketable, practical competencies.
2. Innovation: Hands-on activities foster creativity and inventive thinking.
3. Self-Reliance: Vocational education builds independence and confidence, preparing students for future challenges.

Igniting Curiosity: Understanding Electrical Quantities

Mrs. Jayasree C
TGT(WE)
PM SHRI KV PATTOM SHIFT II

What is Electricity?

Electricity is the flow of tiny particles called electrons. These electrons act as energy carriers, transferring energy to make devices work. You can think of them as invisible, super-tiny runners, constantly moving through a circuit to deliver power.

Meet Our Simple Circuit

A circuit is a complete path that allows electricity to flow from the energy source to the device and back.

Key Components:

- Battery (9V): The energy source for the circuit
- Wires: Conductors that carry electrons through the circuit
- LED (Light Emitting Diode): The output device that emits light when powered

Understanding Electrical Quantities

1. Voltage (V) – The "push" that drives electrons through the circuit.
    - Analogy: Water pressure in a pump
    - Unit: Volts (V)
2. Current (A) – The flow of electric charge through the circuit.
    - Analogy: Amount of water flowing through a pipe
    - Unit: Amperes (A)
    - Example: A standard LED requires approximately 0.02 Amps
3. Resistance (Ω) – Opposes the flow of current, controlling how much electricity passes through.
    - Analogy: A narrow pipe or traffic jam slowing the flow
    - Unit: Ohms (Ω)
    - Example: A 220Ω resistor protects the LED from excessive current
4. Ohm's Law – The Golden Rule

V=I×RV = I \times RV=I×R

Voltage = Current × Resistance

- Ohm’s Law is essential for designing safe and functional circuits. It acts like a secret code for understanding how electricity behaves.

5. Power (W) – The Workhorse of Electricity
    - Definition: The amount of work electricity does per second
    - Analogy: Determines how brightly an LED shines
    - Unit: Watts (W)
    - Formula: P=V×IP = V \times IP=V×I

Hands-On Activity: Build Your Own Circuit Using Tinkercad

Objective: Simulate a simple LED circuit with a 9V battery and a 220Ω resistor.

Steps:

1. Drag & Drop: Place the battery, resistor, LED, and wires onto the workspace.
2. Connect Components: Complete the circuit path ensuring proper polarity for the LED.
3. Simulate: Observe the LED light up.
4. Experiment: Change resistor values to see how brightness and current are affected.

Learning Outcomes

- Understand the basic electrical quantities: Voltage, Current, Resistance, and Power.
- Learn how to design a simple circuit and apply Ohm’s Law in practice.
- Develop problem-solving and experimental skills by adjusting circuit components.
- Gain insight into how electricity powers real-world devices and systems.

Key Takeaways

- Voltage pushes electrons; current is their flow; resistance controls the flow; power determines the work done.
- Hands-on activities, whether simulated or physical, help internalize these fundamental concepts.
- Exploring circuits fosters curiosity, creativity, and a foundation for further electronics learning.

Tip for Students: Keep experimenting! Try using multiple LEDs, different resistors, or even sensors to explore how circuits can be made more complex and interactive.

Welcome to the World of Arduino Uno!

Mr. T R SABARIGIREESAN
TGT(WE)
PM SHRI KV AFS AKKULAM

What is Arduino Uno?

Arduino Uno is a small, beginner-friendly “mini-computer” designed to control electronics projects. It is widely used in:

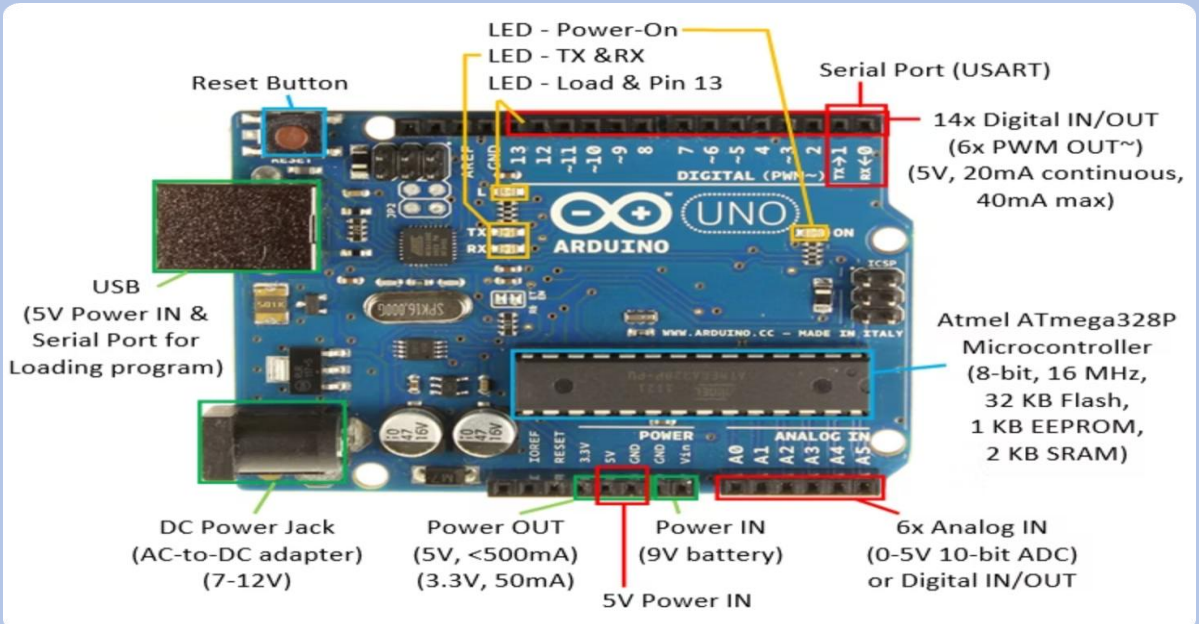
- Robots and automated systems
- Alarms and security devices
- Smart lighting and home automation
- Educational projects for learning coding and electronics

Arduino is easy to learn, making it suitable for students, hobbyists, and beginners interested in hands-on technology projects.

Why Learn Arduino?

- Hands-on Learning: Combines coding with electronics for practical understanding
- Problem-Solving Skills: Develop logical thinking, troubleshooting, and design abilities
- Creativity and Innovation: Students can build interactive projects, sensors, and automated systems
- Real-World Applications: Projects can be applied in smart devices, robotics, environmental monitoring, and automation

Suggested Workshop Activity: Introduce students to Arduino by showing simple projects like a blinking LED or a mini fan controlled by a sensor. Encourage them to brainstorm their own ideas.



Parts of Arduino Uno

Understanding the components of Arduino Uno is essential before building projects:

1. Microcontroller: Acts as the “brain” of the board; executes the program code
2. USB Port: Connects Arduino to a computer for programming
3. Power Pins: Supply power to components like LEDs and sensors
4. Digital Pins: Control digital input and output devices such as LEDs, switches, and buzzers
5. Analog Pins: Measure variable signals from sensors
6. Reset Button: Restarts the program running on Arduino

Diagram Suggestion: Include a labeled Arduino Uno board diagram for better visualization.

Arduino IDE (Integrated Development Environment)

The Arduino IDE is the software used to write, upload, and monitor code:

- Code Editor: Type the instructions (programs) for Arduino
- Upload Button: Sends the code to the board
- Serial Monitor: Allows observation of outputs, debugging, and real-time monitoring

Tip for Students: Always verify the board and port selection before uploading code to prevent errors.

Setting Up Arduino Uno

Steps to get started:

1. Connect Arduino to the computer using a USB cable
2. Open the Arduino IDE
3. Select the Arduino Uno board and corresponding COM port
4. Write the program (sketch) in the IDE
5. Upload the code and observe the output

Experiment 1: Blinking an LED

Objective: Make the onboard LED (pin 13) blink

Steps:

1. Set the pin as output using pinMode(13, OUTPUT)
2. Turn the LED on with digitalWrite(13, HIGH)
3. Wait for 1 second using delay(1000)
4. Turn the LED off with digitalWrite(13, LOW)
5. Upload the code and observe the LED blinking

Learning Outcome: Students learn digital output control, timing, and basic programming structure.

Extension Activity: Try changing the delay time to see how the blink rate changes.

Experiment 2: LED Controlled by Push Button

Objective: Press a button to control the LED

Components:

- LED
- 220Ω resistor
- Push button
- Breadboard and jumper wires

Connections:

- LED connected to pin 9
- Push button connected to pin 2
- Use resistor to prevent excessive current

Learning Outcome:

- Understand digital input
- Learn switching control using code
- Explore real-life applications like turning devices on and off

Practice Tip: Students can extend this project by controlling multiple LEDs or adding a buzzer for interactive feedback.

Understanding Electrical Quantities for Arduino Projects

1. Voltage (V): Pushes electrons through a circuit.
    - Analogy: Water pump pressure
    - Unit: Volts

2. Current (A): The flow of electric charge
    - Analogy: Water flowing through a pipe
    - Unit: Amperes
3. Resistance (Ω): Opposes current flow
    - Analogy: Narrow pipe or traffic jam
    - Unit: Ohms
4. Ohm's Law:

V=I×RV = I \times RV=I×R

Essential for designing safe circuits.

5. Power (W): Amount of work done per second
    - Formula: P=V×IP = V \times IP=V×I
    - Analogy: Determines brightness of an LED

Hands-On Tip: Simulate circuits using Tinkercad before physical setup.

Real-World Applications of Arduino

- Smart Homes: Automated lights, fans, and sensors
- Robotics: Moving robots and drones
- Environmental Monitoring: Weather stations for temperature and humidity
- STEM Education: Practical learning for science, technology, and engineering

Workshop Activity Suggestion: Assign small groups to create their own mini-projects like a temperature sensor or LED traffic light simulation.

Introduction to Arduino Description

Mr. SAMBHU D
TGT(WE)
PM SHRI KV KAVARATTI

Arduino is an open-source electronics platform based on easy to-use hardware and software. It enables beginners to build simple to complex electronic projects without deep knowledge of electronics or programming. The most popular board is the Arduino Uno. Real-Life Applications Smart home systems (e.g., automatic lights, temperature monitoring) School bell automation Basic robotics

Getting Started with Arduino

Description You need the Arduino IDE (Integrated Development Environment) to write and upload programs to the Arduino board.

Step 1. Install Arduino IDE from arduino.cc Connect your Arduino board via USB Select the correct board and COM port Write code and click "Upload"

Example: Blink built-in LED

void setup() { // Set the built-in LED pin as output pinMode(LED_BUILTIN, OUTPUT); }

void loop() { // Turn the LED on

digitalWrite(LED_BUILTIN, HIGH);

delay(1000); // Wait for 1 second // Turn the LED off

digitalWrite(LED_BUILTIN, LOW);

delay(1000); // Wait for 1 second }

Real-Life Use Status indicator for systems (e.g., power ON/OFF)

Basics of C Programming in Arduino - Comments

Comments are lines in the code that are not executed by the program. They are used to explain what the code is doing, making it easier to understand and maintain.

Types of Comments

Single-line comment: starts with //

Multi-line comment: enclosed between /* and */

Example // This is a single-line comment /*

This is a multi-line comment */ Use in Real Life Comments help students, teachers, and developers understand the purpose of each section of code, especially in collaborative or long-term projects

Basics of C Programming in Arduino - Sketch Structure

Arduino uses a simplified version of C/C++. A program (called a sketch) has two main parts:

setup() -3 runs once

loop() - runs repeatedly

eg: Real-Life Use Repeated blinking of an LED for signaling

Syntax

```
void setup() { // Initialization code here }

void loop() { // Repeating code here  }
```

Working with Digital Output

Description Control devices like LEDs using digital pins (ON = HIGH, OFF = LOW).

Syntax

```
pinMode(pin, OUTPUT);

digitalWrite(pin, HIGH); // Turn ON
```

Real-Life Use Warning lights, turn indicators

Working with Digital Output - Example

```
void setup() { // Set pin 8 as output

pinMode(8, OUTPUT); }

void loop() { // Turn ON the LED connected to pin 8

digitalWrite(8, HIGH);

delay(1000); // Wait for 1 second // Turn OFF the LED

digitalWrite(8, LOW);

delay(1000); // Wait for 1 second }
```

This example demonstrates how to turn an LED connected to pin 8 ON and OFF repeatedly, with a one-second delay between each state change. This is a fundamental concept for controlling various digital devices with Arduino.

Understanding Digital Input

Digital input allows Arduino to read external signals like button presses.

```
pinMode(pin, INPUT);
```

digitalRead(pin);

Example: Turn LED ON when button pressed

```
void setup() { // Set pin 2 as input for button
pinMode(2, INPUT); // Set pin 13 as output for LED
pinMode(13, OUTPUT); }
void loop() { // Read button state
 int buttonState = digitalRead(2);
 if (buttonState == HIGH)
{ // Turn LED ON if button is pressed
digitalWrite(13, HIGH); }
else { // Turn LED OFF if button is not pressed
digitalWrite(13, LOW); }
}
```

Real-Life Use

School bell switch or alarm trigger

Arduino Programming Fundamentals

Variables and Data Types Variables are used to store values in your program. Types: int for whole numbers, float for decimal numbers, char for storing single characters and void used to indicate a function does not return a value.

Example 3 : int and float

```
 int ledPin = 9; // LED connected to pin 9
 int timeDelay = 500; // Delay in milliseconds
float voltage = 3.3; // Example float value
 void setup() { // Set ledPin as output pinMode(ledPin, OUTPUT); }
void loop() { // Turn LED ON digitalWrite(ledPin, HIGH);
 delay(timeDelay); // Wait // Turn LED OFF
 digitalWrite(ledPin, LOW);
delay(timeDelay); // Wait
}
```

Example for char:

```
char grade = 'A';
void setup() { Serial.begin(9600); Serial.print("Grade received: "); Serial.println(grade); }
 void loop() { // nothing here
}
```

Example for void:

```
void blinkLED() {
digitalWrite(13, HIGH);
delay(500);
digitalWrite(13, LOW);
delay(500); }
void setup() { pinMode(13, OUTPUT); }
void loop() { blinkLED()}
```

Real-Life Use: Adjustable timer circuit, indicator messages, reusable function blocks

Conditional Statements Description: Control program flow using conditions. if, else if, and else allow for decision-making

Syntax:

```
if (condition) { // action }
else if (other_condition) { // another action }
 else { // default action  }
```

Example 1: Light Control Based on Brightness

```
 int lightSensor = A0;
 int led = 13;
void setup()
 { pinMode(led, OUTPUT); }
void loop() { int lightValue = analogRead(lightSensor);
if (lightValue < 300) { digitalWrite(led, HIGH); }
 else if (lightValue < 700) { digitalWrite(led, LOW); }
else { // Too bright, flash LED digitalWrite(led, HIGH);
delay(100);
```

digitalWrite(led, LOW);

delay(100);

}}

Example 2: Multiple Button Input

int btn1 = 2;

int btn2 = 3;

void setup()

{ pinMode(btn1, INPUT);

pinMode(btn2, INPUT);

pinMode(13, OUTPUT); }

void loop() { if (digitalRead(btn1) == HIGH)

{ digitalWrite(13, HIGH); }

else if (digitalRead(btn2) == HIGH) { digitalWrite(13, LOW); } }

Real-Life Use: Smart light controller, appliance control

Loops

Description: Use loops to repeat actions efficiently. for, while, and do...while are the most common

For Loop Syntax: for (int i = 0; i < 5; i++) { // repeat code }

While Loop Syntax: int count = 0; while (count < 5) { // do something count++; }

Example 1: LED Blink 5 Times

void setup() { pinMode(13, OUTPUT); }

void loop() { for (int i = 0; i < 5; i++)

{ digitalWrite(13, HIGH);

delay(300); digitalWrite(13, LOW);

delay(300); }

delay(2000);

Serial Communication

Exchange data between Arduino and PC. Useful for debugging and monitoring sensor values.

Syntax

Serial.begin(9600);

Serial.print();

Serial.println();

Example void setup() { Serial.begin(9600); }

void loop() { int value = analogRead(A0);

Serial.println(value);

delay(500); }

Real-Life Use: Monitor temperature, sound level, or LDR values

Key Programming Concepts

Variables Store and manipulate data. Serial Communication- Exchange data with a PC. Conditionals -Control program flow based on conditions. Loops- Repeat actions efficiently. Analog Input- Read values from sensors.

These fundamental concepts form the building blocks for any Arduino project, enabling you to create dynamic and responsive

Applications of Arduino Programming

Smart Home Automation Control lights, appliances, and environmental sensors using conditional statements and analog inputs. Robotics and Automation Implement precise movements and decision-making in robots using loops and variable control. Environmental Monitoring Collect and display data from temperature, humidity, and light sensors via serial communication. Security Systems Develop access control systems and security locks using loops for repeated checks and conditional logic. Arduino programming empowers you to build a wide range of practical and innovative solutions across various domains.

WELCOME TO THE WORLD OF PLANT NURSERIES

Mrs. Jayasree C
TGT(WE)
PM SHRI KV PATTOM SHIFT II

What is a Plant Nursery?

A plant nursery is a specialized facility dedicated to propagating, growing, and selling plants. It serves as a hub for cultivating healthy plants that are later supplied to gardens, farms, landscaping projects, and research institutions.

Types of Nurseries:

- Retail Nurseries: Sell plants directly to individual customers.
- Wholesale Nurseries: Supply plants in bulk to other businesses or institutions.
- Research Nurseries: Focus on plant breeding, experimentation, and scientific studies.

Key Products:
Nurseries provide a diverse array of plants, including:

- Vegetables and fruits
- Ornamental flowers and shrubs
- Trees and bonsais
- Groundcover plants

Purpose of Including 'Plant Nursery' in Class VII Vocational Education

Incorporating plant nursery training in Class VII aims to:

- Develop practical skills in plant care, propagation, and maintenance.
- Prepare students for careers in horticulture, landscaping, gardening, and allied industries.
- Foster entrepreneurial skills for starting a nursery or gardening business.
- Promote sustainable practices and environmental awareness.
- Provide hands-on training and industry-relevant skills for direct workforce entry.

This training equips students with valuable skills, enhancing employability and contributing to community green initiatives.

Essential Infrastructure & Equipment

- Greenhouses: Climate-controlled structures essential for optimal plant growth.
- Potting Machines: Automated systems for quick and uniform soil filling in containers.
- Irrigation Systems: Efficient water management systems ensuring precise hydration.

- Cold Frames: Protective structures that shield young plants from frost and adverse weather.

Plant Health & Pest Management

- Integrated Pest Management (IPM): A holistic, eco-friendly approach to controlling pests.
- Soil Testing: Regular analysis of soil nutrients and pH levels to ensure optimal growth.
- Common Pests: Aphids, spider mites, and whiteflies require constant vigilance.
- Plant Diseases: Monitoring and managing fungal, bacterial, and viral infections is critical for plant survival.

Trends, Scope & Innovations in Plant Nurseries

- Vertical Farming: Space-efficient cultivation using vertically stacked layers.
- Hydroponics & Aquaponics: Soilless growing methods that optimize water and nutrient use.
- Automation: Robotic systems for planting, harvesting, and monitoring crops to increase efficiency.
- Sustainable Practices: Adoption of organic methods, water conservation, and eco-friendly cultivation techniques.

Soilless Greengram Microgreen Farming

Nutritional Benefits:

- Microgreens are nutrient-dense, containing up to 40x more nutrients than mature plants.
- Example: Radish microgreens have 6x more Vitamin C than mature radishes.
- Varieties include radish, broccoli, kale, basil, and greengram.

Advantages of Soilless Farming:

- Water Efficiency: Uses up to 90% less water than traditional soil farming.
- Disease Control: Eliminates soil-borne pathogens, reducing crop loss.
- Cleaner Harvest: Free from soil residue, improving hygiene and shelf-life.
- Faster Growth Cycle: Optimized conditions accelerate germination and growth.

Potential of Greengram Microgreens in India:

- Nutritional Profile: Rich in protein (24%), Vitamin C, iron, and dietary fiber.
- Rapid Growth: Ready for harvest in 7–10 days.
- Digestibility: Easier to digest than mature beans.
- Cultural Acceptance: Popular as sprouts, widely available and culturally integrated.

Step-by-Step Greengram Microgreen Cultivation

Step 1: Seed Selection & Soaking

- Quality Seeds: Choose untreated, organic greengram seeds from reputable suppliers.
- Soaking: Soak seeds in clean, room-temperature water for 4–6 hours (1 cup water per 100 g seeds).
- Purpose: Softens the seed coat to initiate germination and ensure uniform growth.

Step 2: Tray Preparation & Spreading

- Tray Setup: Use a flat, solid-bottom tray (e.g., 10×20 inches) without holes; place a perforated tray on top.
- Medium Hydration: Hydrate coco coir with a 1:4 water-to-coir ratio.
- Layering: Spread a 1-inch thick layer of hydrated coir evenly in the perforated tray.
- Seed Distribution: Scatter soaked seeds uniformly, avoiding clumps.

Step 3: Germination & Blackout Period

- Stacking Trays: Place a solid-bottom tray on top of the seeded tray.
- Blackout Conditions: Store in a dark, warm area (20–25°C) for 2–3 days.
- Applying Weight: Add 5–10 kg on the top tray to promote root development.
- Misting: Lightly mist seeds 2–3 times daily to maintain moisture.

Step 4: Light Exposure & Watering

- Unstacking: After 2–3 days, when radicles reach 0.5–1 inch, unstack trays to prevent mold.
- Light Source: Expose trays to bright, indirect sunlight or LED grow lights (16–18 hours/day).
- Watering: Implement bottom watering by filling the solid tray with 1 cup water daily.

Step 5: Harvesting & Storage

- Harvest Timing: Typically 7–10 days post-seeding, when cotyledons are fully open.
- Method: Use a sharp, clean knife or scissors to cut stems above the growing medium.
- Storage: Gently rinse, pat dry, and store in an airtight container in the refrigerator for 5–7 days.
- Expected Yield: Approximately 100–150 g of fresh microgreens per 10×20 inch tray.

AUTOMATIC NIGHT LAMP WITH ARDUINO

Mr. T R SABARIGIREESAN
TGT(WE)
PM SHRI KV AFS AKKULAM

Project Overview

The Smart Illumination Lamp automatically switches on in darkness and turns off in light, saving energy and providing convenience. The system uses Arduino logic with if-else statements to make decisions based on ambient light levels.

Key Components

Component	Function
Arduino Uno	Acts as the brain of the system, controlling logic and outputs.
Light Dependent Resistor (LDR)	Measures ambient light intensity.
LED (any color)	Serves as the output light source.
10kΩ resistor	Used in the LDR voltage divider circuit.
220Ω resistor	Limits current through the LED to protect it.

Circuit Diagram & Connections

LDR Setup:

- Connect one leg of the LDR to 5V.
- Connect the other leg to A0 (analog input) and to a 10kΩ resistor.
- Complete the voltage divider by connecting the 10kΩ resistor to ground.

LED Setup:

- Connect the anode to digital pin 13 via a 220Ω resistor.

- Connect the cathode to ground.

This configuration allows the Arduino to detect light levels and control the LED accordingly.

Testing and Calibration

1. Upload Code: Transfer the Arduino sketch to the board.
2. Monitor Readings: Open the Serial Monitor to observe LDR readings (range: 0–1023).
3. Set Threshold: Adjust threshold value to determine when the LED should activate.
4. Function Test: Cover the LDR to simulate night and ensure the LED switches on.

Project Extensions

- Brightness Control: Use a potentiometer to adjust sensitivity threshold.
- Multiple LEDs: Create sequences where additional LEDs turn on as darkness increases.
- Power Relay: Control mains-powered lamps safely (adult supervision required).
- Time Delay: Add delays in code for smooth transitions between states.

Optional Enhancements

- Automatic Day/Night Detection: Integrate real-time clocks for time-based automation.
- Energy Saving Mode: Reduce brightness of LEDs when partial light is detected.
- IoT Integration: Connect to a mobile app for remote monitoring and control.

Summary:

This project demonstrates the use of sensors and microcontrollers to automate everyday devices. It introduces key concepts such as analog sensing, decision-making in Arduino, and circuit design, while also offering opportunities for expansion into advanced automation projects.

SCRATCH-INTRODUCTION TO ANIMATION AND GAMES

Mr. BINESH M N
TGT(WE)
PM SHRI KV ERNAKULAM

What is Scratch?

Scratch is a visual programming language that allows students to create interactive stories, games, and animations.

- Helps students think creatively
- Promotes systematic reasoning
- Encourages collaborative work

About Scratch

- Scratch is the world's largest coding community for children.
- Features a simple, visual interface for creating digital projects.
- Developed and moderated by the Scratch Foundation, a nonprofit organization.
- Scratch is free and available in over 70 languages.

Who Uses Scratch?

- Designed for children aged 8–16, but used by learners of all ages.
- Millions of projects created in homes, schools, museums, libraries, and community centers.
- Promotes exploration, experimentation, and sharing.

Scratch and NEP 2020

- NEP 2020 emphasizes experiential learning and introducing coding from Class 6.
- Encourages schools to integrate modern technology for accessible and engaging education.
- Scratch supports digital literacy, problem-solving, and computational thinking.

Importance of Coding for Young Learners

- Teaches logical and creative problem-solving.
- Stimulates critical thinking and innovation.
- Helps children express their creative side using technology.

- In systems with limited creativity, infrastructure, or outdated curriculum, coding is a structured approach to develop rational reasoning skills.

Scratch in Schools

- Used at all educational levels, from elementary to college.
- Applicable across math, computer science, language arts, and social studies.
- Teachers can access lesson plans, tutorials, and project ideas via the Scratch for Educators page.
- Develops logic, creativity, collaboration, and computational thinking.

Summary

Scratch is more than a programming language; it is a learning platform that blends creativity, technology, and problem-solving.

- Equips students with 21st-century skills
- Encourages innovation and curiosity
- Makes learning interactive, fun, and engaging

EMPOWERING SUSTAINABLE LED SERVICING: A COMPONENT BASED APPROACH FOR SKILL DEVELOPMENT

Mrs. Jayasree C
TGT(WE)
PM SHRI KV PATTOM SHIFT II

India's Booming LED Market and the Need for Sustainable Repair Skills

Market Overview

India's LED market is expanding rapidly, with an annual growth rate of 20–25%. However, millions of LED lights enter the waste stream every year, creating a pressing need for skilled technicians who can repair and extend the life of these products.

The Current Landscape: A "Replace-and-Discard" Mentality

The common practice today is to replace entire LED fixtures when they malfunction.

Why It Happens

- Lack of component-level repair knowledge among technicians.
- Limited access to diagnostic tools.
- Service calls typically involve swapping out the entire unit.

The Hidden Costs

- Economic Burden: High replacement costs for both consumers and businesses.
- Environmental Impact: Contributes to India's 3.2 million tons of e-waste annually.
- Resource Depletion: Increases demand for raw materials like aluminum, copper, and rare earths.
- Skill Gap: Fewer opportunities for genuine repair specialists.

The Sustainable Solution: Component-Based LED Servicing

Instead of discarding the whole unit, technicians can repair only the faulty parts.

- Identify Fault: Pinpoint defective components such as drivers or LED chips.
- Replace Only: Swap out the faulty part, not the entire fixture.
- Extend Lifespan: Increases product life by 2–3 years, reducing waste.

Anatomy of an LED Light

Component	Function	Notes
LED Driver (SMPS)	Converts AC to DC; common failure point	Popular brands: Mean Well, Philips Xitanium
LED Chips/Modules	Emit light; prone to degradation	Examples: SMD 2835, COB arrays
Heat Sink	Manages heat dissipation, ensures longevity	Usually made of aluminum or copper
Optics (Lens/Diffuser)	Shapes and diffuses light output	May yellow or degrade with use
PCB (Printed Circuit Board)	Connects and integrates components	Critical for circuit reliability

Tangible Benefits

- Cost Savings: 70–80% cheaper than replacing a new fixture.
- E-Waste Reduction: Diverts 100–200g of waste per LED light from landfills.
- Skill Creation: Develops specialized technicians for a rapidly growing market.
- Local Economy Boost: Encourages small repair businesses, creating 2–3 jobs per unit serviced.

Why Teach Component-Based LED Servicing?

- Fills a Gap: Addresses a critical gap in current vocational training.
- Future-Proof Skills: Prepares students for high-demand technical careers.
- Fosters Entrepreneurship: Enables self-employment in electronics repair.
- National Alignment: Supports “Make in India” and “Skill India” initiatives.

Curriculum Design: Hands-On and Visual Approach

- Module 1: LED Basics & Safety (15 hrs)
  Electrical fundamentals, safety protocols (ESD, electric shock prevention).
- Module 2: Component Identification (20 hrs)
  Detailed study of LED parts and their functions.
- Module 3: Diagnostic Techniques (30 hrs)
  Using multimeters and oscilloscopes for fault detection.
- Module 4: Soldering & Desoldering (25 hrs)
  Practical skills in handling SMD components.
- Module 5: Repair & Testing (30 hrs)
  Case studies, functional testing, and quality checks.

Emphasis:

- High-resolution diagrams of circuits and components.
- Visual aids such as exploded views of LED fixtures.
- Datasheets with pinouts for better understanding.

Essential Training Infrastructure

- 5 Workstations: ESD-safe benches with proper lighting.
- 10 Tools: Soldering/desoldering stations, multimeters, hot air guns.
- 30 Consumables: Solder, flux, desoldering wick, spare parts.
- 20 Dummy Boards: Faulty LED lights for real-world practice.

Conclusion: Lighting the Path to a Sustainable Future

Component-based LED servicing is essential for India's circular economy. By training youth in this field:

- We reduce e-waste
- Save valuable resources
- Create jobs and boost the local economy
- Build national expertise in sustainable electronics

Investing in this training not only supports green practices but also illuminates a brighter and more sustainable future for India.

Bright Ideas: A Student's Guide to LED Tube Repair

- Empowers students to understand and fix common LED light problems.
- Encourages practical troubleshooting and hands-on learning.
- Helps reduce energy consumption and e-waste in homes and schools.

Why LEDs are the Future of Lighting

- Energy Efficient: Use 50–80% less electricity than fluorescent tubes.
- Cost Savings: Can save up to ₹1,000 annually per fixture.
- Long Lifespan: Operate for up to 50,000 hours, compared to 10,000 hours for fluorescent tubes.
- Eco-Friendly: Contain no mercury, reducing toxic waste.

PAPER PEN MAKING: AN INTRODUCTION

Mr. T R SABARIGIREESAN
TGT(WE)
PM SHRI KV AFS AKKULAM

Crafting Sustainable Paper Pens: An Eco-Friendly Innovation

Introduction

Plastic waste has become one of the major environmental challenges of the 21st century. Disposable plastic pens contribute significantly to this problem, with millions of units discarded every day. As an alternative, paper pens have emerged as a creative, eco-friendly solution. They are made primarily from recycled paper and are biodegradable, reducing plastic usage and landfill accumulation. This project explores the process of making sustainable paper pens, their technical aspects, and their broader impact on society and the environment.

1. **Materials Required**

To design a durable and functional paper pen, the following materials are needed:

- Paper: Thick sheets, recycled paper, or cardstock to form the pen body. Strong paper ensures longevity.
- Writing Component: A pen refill (ball pen ink tube) or pencil lead. This provides the functional writing element.
- Adhesive: Glue or synthetic resin to bond the layers securely.
- Cutting Tools: Scissors, ruler, and paper cutter for precise shaping and trimming.
- Optional: Decorative sheets, eco-friendly laminates, or embossing tools for customized finishing.

2. **Preparing the Paper Body**

The paper body forms the foundation of the pen.

1. Cutting Strips: Cut recycled paper into strips of about 1 inch in width and 10–12 inches in length.
2. Layering: Stack and glue about 20 strips to create a solid base, ensuring each layer bonds tightly.
3. Forming a Blank: Roll or press the strips into a cylindrical blank that will serve as the pen's main body.
4. Drying: Allow sufficient time for the glued layers to dry, ensuring a strong and stable base.

Tip: Using slightly glossy recycled paper adds extra resistance against moisture and everyday wear.

3. **Inserting the Refill or Lead**

A functional pen requires careful placement of the writing component.

- Creating the Channel: Carve a central groove or hollow channel in the layered blank using a thin tool or drill.
- Placing the Refill: Insert a standard pen refill or pencil lead into the channel. Ensure it is centered and aligned.
- Securing the Refill: Apply a drop of synthetic resin or glue at the edges to lock the refill firmly.
- Testing: Before proceeding, check whether the refill writes smoothly and is properly aligned with the pen tip.

4. **Assembly and Shaping**

After securing the writing component, the pen body is shaped and finished.

- Multi-Layer Construction: Additional paper layers can be laminated around the blank for extra strength.
- Shaping Options:
    - *Hand Shaping*: Sanding or trimming the body manually for an organic look.
    - *Lathe Turning*: For precise and professional shaping.
    - *Embossing*: To create grooves or textures for better grip.
- Final Touches: Smooth the surface, add eco-friendly polish, or wrap with decorative recycled sheets.

5. **Technical Insights (Based on Patents)**

Paper pens are not just simple DIY crafts; they involve smart design concepts:

- Receptacle Design: The refill channel is often raised about 2 mm above the base for secure placement.
- Securing Method: Adhesive bonding is combined with small pin-like mechanisms for stability.
- Assembly Methods: Gluing, thermal deformation, or mechanical clipping can be used.
- Strength Considerations: Multi-layer laminates improve durability while keeping the pen lightweight.

6. **Practical Benefits**

Paper pens provide multiple benefits at individual, social, and environmental levels:

- Economic: Lower cost compared to plastic pens when made in bulk.
- Environmental: Reduces plastic waste, promotes recycling, and supports circular economy.
- Educational: Offers students hands-on exposure to sustainable product design.
- Employment: Opens opportunities for local businesses, self-help groups, and small-scale industries.

7**. Real-World Applications**

- In Schools: Students can be encouraged to make their own paper pens as part of eco-clubs and skill-building workshops.
- In Communities: NGOs and startups promote paper pens as green alternatives at events and campaigns.
- In Industries: Paper pens are increasingly used by corporates for branding, CSR activities, and eco-friendly office supplies.

Platforms like *YouTube* and *Instructables* already feature creative models, demonstrating how this innovation is spreading globally.

8. **Why Paper Pens Matter**

1. Eco-Friendly: 100% biodegradable and reduces dependence on plastic.
2. Energy Efficient: Requires less energy to manufacture compared to plastic pens.
3. Sustainable Future: Aligns with global sustainability goals such as *SDG 12 (Responsible Consumption and Production)*.

Conclusion

Paper pens are not just stationery items; they represent a movement toward sustainable living. By adopting paper-based writing instruments, we contribute to reducing plastic waste, saving resources, and nurturing eco-friendly practices. Whether crafted by students in a classroom or produced on a larger scale, paper pens symbolize creativity, responsibility, and innovation.

The future looks promising with advancements in eco-materials and mass production techniques. Investing in paper pens is more than adopting a product—it is embracing a vision for a greener planet.

BUILD A WEATHER STATION!

Mr. T R SABARIGIREESAN
TGT(WE)
PM SHRI KV AFS AKKULAM

DIY Arduino Weather Station

Measuring Temperature & Humidity with DHT11

Introduction

Weather affects our daily lives in countless ways. From deciding what to wear to managing agriculture, accurate weather data is essential. With simple electronics and coding, students can create their own Arduino-based weather station. This project introduces the DHT11 sensor for measuring temperature and humidity, and an I2C LCD display for real-time monitoring. It is a practical, hands-on activity that builds skills in electronics, coding, and environmental awareness.

The DHT11 Sensor

The DHT11 is a low-cost digital sensor designed to measure:

- Temperature → Detects how hot or cold the environment is.
- Humidity → Measures water vapor in the air.

Applications

- Smart Homes: Maintain comfortable indoor environments.
- Weather Monitoring: Track climate changes in classrooms, gardens, or labs.
- Learning Tool: Introduces beginners to digital sensors and data collection.

Connecting the DHT11 to Arduino

Wiring the DHT11 is simple and requires only three connections:

- VCC → 5V (power supply for the sensor)
- GND → GND (ground connection)
- DATA → Pin 2 (data signal sent to Arduino)

Once connected, the Arduino can receive continuous temperature and humidity readings from the sensor.

Adding an I2C LCD Display

While sensor data can be viewed in the Serial Monitor, adding an I2C LCD display makes the project more interactive and user-friendly.

Connections for I2C LCD

- A4 → SDA (data line)
- A5 → SCL (clock line)
- VCC → 5V (power supply)
- GND → GND (ground connection)

This allows live readings to be displayed directly on the LCD, without needing a computer.

Putting It All Together

1. Connect the DHT11 sensor to Arduino.
2. Wire the I2C LCD to Arduino.
3. Upload the Arduino sketch using the DHT11 and LiquidCrystal_I2C libraries.
4. Observe live temperature and humidity readings on the display.

Next Steps & Beyond

Once the basic weather station is working, you can expand it with additional features:

- Outdoor Enclosure: Protect sensors and electronics from rain and dust.
- Data Logging: Record readings over time using an SD card module.
- Additional Sensors: Add modules for wind speed, rainfall, or barometric pressure.
- IoT Integration: Send weather data to a smartphone app or a cloud dashboard.

IOT: REAL-TIME DEVICE CONTROL WITH ESP32 AND THINGSPEAK API

Mrs. DUMPALA PUSHPALATHA
TGT(WE)
PM SHRI KV KALPETTA

Exploring IoT with ESP32 and Wokwi

How devices sense, think, act, and connect to build smart environments

Introduction: What is IoT?

The Internet of Things (IoT) is a system where everyday objects are connected to the internet, enabling them to sense, think, act, and connect.

- Sense → Devices collect data from their environment (e.g., sensors for temperature, motion, or light).
- Think → The data is processed and decisions are made using microcontrollers or cloud platforms.
- Act → Devices perform actions, such as switching on a fan, triggering an alarm, or controlling lights.
- Connect → Devices share data and can be monitored or controlled remotely over the internet.

Example: Imagine switching on your AC from miles away or checking your plants' moisture levels via a mobile app.

IoT in Action: Traditional vs. Smart Systems

IoT enhances traditional automation by adding remote monitoring, alerts, and control.

Application	Traditional Automation	IoT-Enabled Automation
Fire Alarm	Siren only	Siren + instant alerts to fire station and owner
Smart Farming	Auto pump	Auto pump + detailed alerts, remote control, water-saving strategies
Burglar Alarm	Siren / Light	Siren / Light + instant mobile alerts to owner

This transformation adds immense value, making systems more efficient, reliable, and user-friendly.

Why ESP32 for IoT?

The ESP32 microcontroller is one of the most popular choices for IoT projects because of its powerful features:

- Built-in Connectivity → Wi-Fi and Bluetooth integrated (unlike Arduino UNO, which needs add-ons).
- Superior Performance → Faster processor and more memory.
- Arduino IDE Compatible → Works with the same coding environment students already know.
- Cost-Effective → Compact, powerful, and affordable, making it ideal for scalable IoT solutions.

While Arduino UNO can be used for IoT, ESP32 is more efficient and future-ready.

Why Use Wokwi?

Wokwi is a free, browser-based simulator that fully supports ESP32 development.

- No hardware required → Everything runs online.
- Wi-Fi & Cloud Simulation → Test IoT features like internet connectivity and APIs.
- Easy Integration → Supports popular IoT libraries and services like ThingSpeak.

This makes Wokwi an ideal platform for hands-on IoT learning before deploying real hardware.

Hands-On IoT Activities

Activity 1: LED Blink on Wokwi

- Objective: Learn basic LED control with ESP32.
- What You Learn: Digital output, GPIO pin usage, and Arduino IDE coding.
- Outcome: A locally controlled blinking LED—the foundation for remote IoT control.

Activity 2: Sensor-to-Cloud (DHT Data Visualization)

- Objective: Send real-time temperature and humidity data to the cloud.
- Components: ESP32 + DHT sensor (simulated on Wokwi).
- Cloud Platform: ThingSpeak for data visualization.
- Outcome: View sensor data live on ThingSpeak charts from anywhere.

Thing Speak Setup for IoT

1. Sign Up / Sign In → Access ThingSpeak via MathWorks account.
2. Create New Channel → Name it (e.g., *Weather Data* or *LED Control*).

3. Enable Fields → Example: Field 1 = LED State, Field 2 = Temperature.
4. Note Channel ID & API Keys → Needed to connect ESP32 code.
5. Test API Calls → Update/read fields via browser before running ESP32 code.

Activity 3: Remote LED Control via ThingSpeak

- Objective: Demonstrate remote IoT control.
- Process:
    - ESP32 checks ThingSpeak channel for LED state.
    - User updates the channel (ON/OFF) from any device.
    - LED responds instantly.
- Outcome: Students experience real IoT functionality—remote device control through the cloud.

Understanding Device State and Control

- Device State → Current status of a device (e.g., LED ON/OFF, fan speed, sensor reading).
- Remote Control → The ability to monitor and modify device state from anywhere in the world.

This concept is central to IoT, bridging physical devices with digital platforms.

Conclusion

IoT is revolutionizing the way we interact with technology. By combining sensors, microcontrollers, cloud platforms, and connectivity, we can create smarter environments.

Through ESP32 and Wokwi, students can:

- Learn coding and electronics.
- Build hands-on IoT prototypes.
- Understand cloud-based data logging and control.

FACE RECOGNITION: USING MACHINE LEARNING & SCRATCH

Mrs. KASMEERA K S
TGT(WE)
PM SHRI KV SAP

What is Artificial Intelligence (AI)?

Artificial Intelligence (AI) is the ability of machines or computers to perform tasks that normally require human intelligence.

AI systems are designed to think, learn, and solve problems, just like humans.

Examples of AI in Daily Life

- Virtual Assistants (e.g., Siri, Alexa, Google Assistant)
- Face Recognition in smartphones
- Recommendation systems (YouTube, Netflix, Amazon)
- Self-driving cars

What is Machine Learning (ML)?

Machine Learning (ML) is a subset of AI.

Instead of being explicitly programmed for every task, machines are trained with data. Over time, they learn patterns and improve their performance.

In simple terms: *AI is the broad goal, and ML is one way to achieve it.*

Types of Machine Learning

1. Supervised Learning

- Definition: The model is trained using labeled data (input and correct output are known).
- Goal: Learn from examples to make predictions.
- Examples:
    - Predicting house prices based on size, location, etc.
    - Classifying emails as “Spam” or “Not Spam.”

2. Unsupervised Learning

- Definition: The model is trained with unlabeled data (no correct answers given).
- Goal: Find hidden patterns or groupings in data.
- Examples:
    - Customer segmentation in marketing.
    - Grouping similar news articles.

3. Reinforcement Learning

- Definition: The model learns by trial and error. It receives rewards for correct actions and penalties for wrong ones.
- Goal: Learn the best strategy (policy) to maximize rewards.
- Examples:
    - Teaching robots to walk.
    - Game-playing AI (e.g., AlphaGo).

Summary Table

Type of Learning	Input Data	Goal	Example
Supervised Learning	Labeled data	Predict output from input	Predict exam marks from study hours
Unsupervised Learning	Unlabeled data	Find hidden patterns/groups	Grouping customers by shopping habits
Reinforcement Learning	Interaction with environment	Learn best actions (maximize rewards)	Training a robot or self-driving car

Conclusion

Artificial Intelligence and Machine Learning are transforming the world around us. From simple daily tasks like voice assistance to complex systems like autonomous vehicles, these technologies show how machines can sense, learn, and act intelligently. Understanding AI and its learning methods prepares students to engage with the future of technology.

ADAPTIVE BRIGHTNESS CONTROL WITH MACHINE LEARNING

Mr. SAMBHU D
TGT(WE)
PM SHRI KV KAVARATTI

Understanding Adaptive Brightness Control

Introduction

Adaptive Brightness Control refers to the technique of automatically adjusting the brightness of a light source based on surrounding (ambient) light conditions. The primary aim is to optimize visibility and comfort for users while also ensuring energy efficiency.

This technology is widely used in smartphones, smart TVs, laptops, and intelligent lighting systems. It has become an essential feature in modern smart devices because of its ability to balance user comfort with power saving.

Why Adaptive Brightness?

- Enhances user experience – prevents eye strain in dark or overly bright conditions.
- Saves energy – brightness is optimized to just the right level.
- Ubiquitous – implemented in a variety of smart consumer electronics and IoT-enabled systems.

Project Objectives: Smart Lighting System

1. Arduino-Based Brightness Control
    - Build a system that automatically adjusts LED brightness using an Arduino based on input from an ambient light sensor (LDR).
2. Predictive Lighting Model
    - Train a Linear Regression model to predict optimal LED brightness values from light sensor data.
    - This allows the system to be not only reactive but also predictive, enhancing adaptability.

Key Components

- Arduino Uno/Nano – The microcontroller that acts as the brain of the project.
- LDR (Light Dependent Resistor) – Detects ambient light levels. Resistance decreases as light increases.
- LED (Light Emitting Diode) – Light source whose brightness is controlled.
- Potentiometer – Provides manual brightness adjustments during data collection phase.
- Breadboard & Jumper Wires – For quick and flexible circuit assembly.
- LCD/Serial Monitor – Displays real-time values of light intensity and LED brightness.

Data Collection for Model Training

To make the system intelligent, we needed to train a predictive model. For this:

1. Manual Adjustment
    - Using the potentiometer, LED brightness was varied at different levels.
2. Recording Sensor Data
    - At each brightness setting, the ambient light intensity was recorded using the LDR.
3. Creating a Dataset
    - Each record included:
        - Ambient light reading (input, from LDR).
        - Corresponding LED PWM value (output, brightness level).
4. Regression Analysis
    - A Linear Regression model was trained on this dataset.
    - The model learns the relationship between LDR readings and LED brightness.
    - Once trained, it predicts the best LED PWM value for any given light condition.

System Working

1. Sense – The LDR continuously monitors ambient light intensity.
2. Think – Arduino processes the LDR reading and uses the trained regression model.
3. Act – The LED brightness is adjusted automatically using PWM (Pulse Width Modulation).
4. Adapt – Over time, the system refines its predictions for improved comfort and energy savings.

Applications of Adaptive Brightness Control

- Consumer Electronics: Smartphones, tablets, laptops, TVs.
- Smart Homes: Energy-efficient lighting systems.
- Automobiles: Dashboard lights and smart headlights.
- Workspaces: Automatic lighting for offices, reducing eye strain.

Conclusion

This project demonstrates how Arduino, sensors, and simple machine learning (Linear Regression) can be combined to create a smart lighting system. By collecting real-world data and training a model, the system intelligently predicts and adjusts brightness, achieving both comfort and energy efficiency.

Such a system highlights the potential of blending IoT and AI concepts to build smarter environments and contributes to the growing field of automation and intelligent control systems.

PROJECTS PRESENTED BY GROUPS

Group 1: Home Automation Using Adafruit IO

This project demonstrates a basic IoT-based home automation system using the Adafruit IO cloud platform and an ESP8266/ESP32 microcontroller.

- Setup:
  - Two LEDs connected to GPIO pins, controlled via transistor switches.
  - ESP board connects to Wi-Fi and communicates with the Adafruit IO MQTT server.
- Working Principle:
  - Two separate Adafruit IO feeds were created, one for each LED.
  - The web-based Adafruit IO dashboard provides toggle switches.
  - When a switch is toggled, a signal is sent via MQTT to the ESP board, turning the corresponding LED ON/OFF.
- Learning Outcome:
  - Introduces home automation basics, MQTT communication, and cloud integration.
  - Helps learners understand remote control of devices, making it ideal for school students and IoT beginners.

Group 2: Penalty Kick in Football – Interactive Video Game

Developed using Scratch software, this project is designed for students in Grades 6–8 and simulates a penalty kick scenario in football.

- Features:
  - Sprites (3): Player (kicker), goalkeeper, and football.
  - Backdrop (1): A football stadium for a sporty environment.
- Gameplay:
  - The player controls the kicker to aim and take shots on goal.
  - The goalkeeper moves side-to-side attempting to block the ball.
  - The goal is to score maximum points while avoiding saves.
- Learning Objectives:
  - Introduce students to basic programming concepts.

- Encourage logical thinking, creativity, and storytelling through coding.
- Spark interest in game design and interactive media.

Group 3: Self-Driving Car – Design and Function

This project explores autonomous mobile robots with a focus on line-following using IR sensors.

- Core Components:
  - Arduino Uno – central microcontroller.
  - IR Sensors (TCRT5000 array) – detect line contrast.
  - L298N Motor Driver – controls motor power.
  - DC Geared Motors – provide movement.
- Working Principle:
  - Sensor Input: IR sensors emit and detect infrared reflections.
    - Black line absorbs IR → low signal.
    - White surface reflects IR → high signal.
  - Control Logic: Arduino processes sensor data.
  - Motor Output: L298N drives the motors.
  - Correction: Adjusts wheel speeds to keep the robot aligned with the track.
- Applications:
  - Robotics education.
  - Early understanding of autonomous driving systems.

Group 4: Smart Dustbin Using Arduino

With the need for hygienic waste disposal, this project presents a hands-free smart dustbin that also signals when full.

- Components:
  - Arduino Uno/Nano, HC-SR04 Ultrasonic Sensor, IR Obstacle Sensor, Servo Motor, Red LED, Breadboard, Power Supply.
- Working Principle:
  - Ultrasonic Sensor: Detects a hand/object within a set range (e.g., 20 cm) → triggers servo motor to open lid.
  - After a delay (3–5 sec), the lid closes automatically.
  - IR Obstacle Sensor: Monitors trash level inside the bin.

    - When full, a red LED lights up to alert.
- Applications:
    - Public and household waste management.
    - Schools, hospitals, and smart city projects.

Group 5: Smart Parking System Using Arduino Uno

This project simulates a real-world parking system to improve efficiency and reduce human intervention.

- Components:
    - Arduino Uno, IR sensors, Servo motors, I2C LCD display.
- Features:
    - Vehicle Detection: IR sensors detect entry and exit.
    - Gate Control: Servo motors open/close gates automatically.
    - Slot Management: Available slots displayed on LCD in real-time.
    - Safety Feature: Prevents over-parking by allowing entry only if slots are free.
- Objective:
    - To create an automated parking management system.
    - Track vehicle movement and update slot availability instantly.

PHOTOS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ZONAL INSTITUTE OF EDUCATION AND TRAINING
K.V.S.
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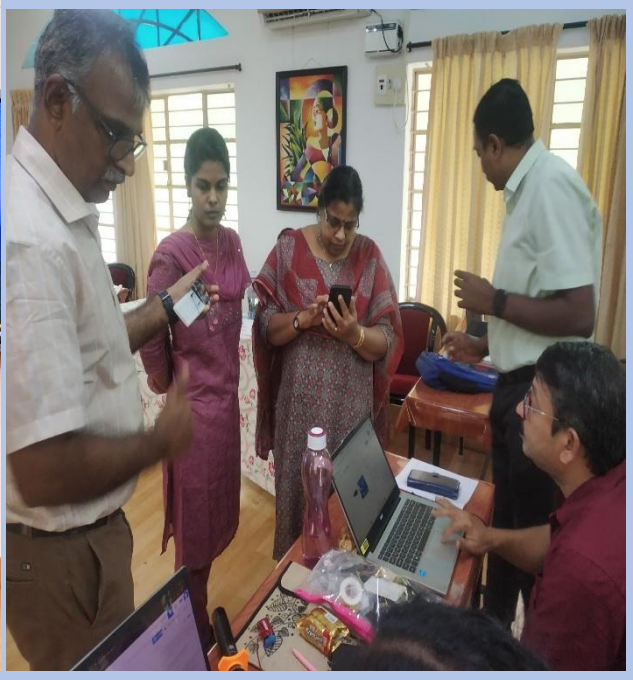
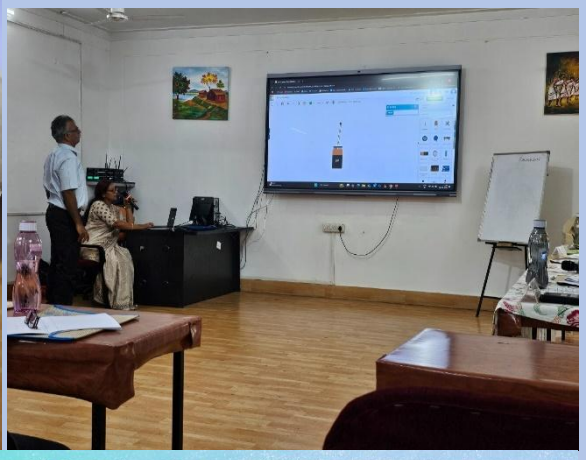
WELCOME
5-DAYS WORKSHOP ON
16.06.2025 TO 20.06.2025


16.06.2025


Empowering Sustainable LED Servicing: A Component-Based Approach for Skill Development



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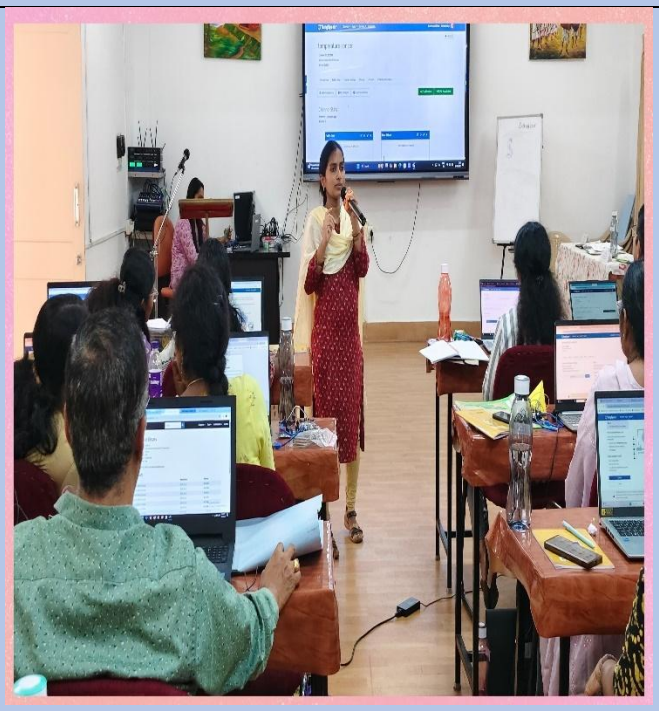

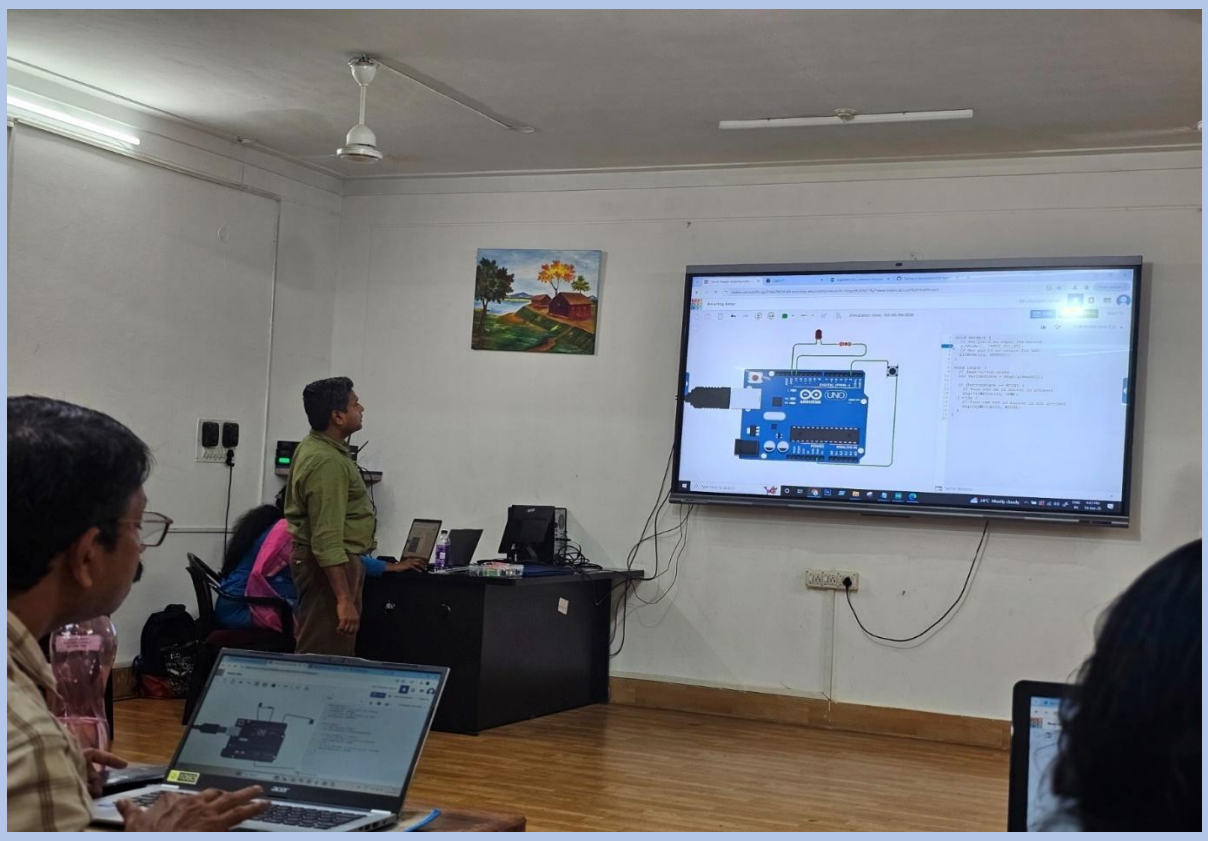


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