



Practice-1

Title of the Practice

PCB Manufacturing from Designing to Manufacturing by SMT for Robotics & Artificial Intelligence Applications

For Student Learning purpose of PCB Manufacturing from designing to manufacturing **for Robotics and Artificial Intelligence.**

(We have applied for Centre of Excellence in PCB Manufacturing to Rajasthan Technical University – RTU Kota and waiting for granting)

Arya College of Engineering and Research Centre-ACERC are in a process of establishing Centre of Excellence in PCB Manufacturing and its Application and created a State of the art manufacturing facility of Print Circuit Board by **Surface Mounting Technology (SMT)** for providing the facility for creation of different type of **Robots manufacturing and incorporation of Artificial Intelligence into Robots** and different kind of apparatuses which are required for using of Industrial Revolution 4.0 in India.

ACERC has been working for last three years in the field of Electronics and Print Circuit Board manufacturing by surface mount technology and creating different kind of electronic Circuits Board of PCB's installed in various kinds of equipment's. Once PCB circuit is prepared and different kind of software or language or input or Arduino language is integrated so that they can function accordingly as per design and output required.

Objective:-

- The SMT Lab is all about learning new technologies and applying them to solve real-life problems as per the requirement of the society.
- To teach students from basic designing to manufacturing of various electronic circuits in the form of **PCB**.
- To inspire students towards technology and prepare them for the 4th Industrial Revolution in the field of PCB, Robotics, Automation, and Artificial Intelligence.
- To manufacture any kind of Robots or Small equipments for learning purpose and in order to create the **Machine Learning** environment first we have to make electronic circuits in the form of **Gerber File** and then apply programming on it so that they can conduct the work in a precise manner and this process is very important as all kind of Robotic hardware and product requires manufacturing of PCB by the latest technology i.e. Surface Mounting



Technology and later machine learning languages Software's are installed to perform various function on the Hardware.

1. **Chemical Method**
2. **Mechanical Method**
3. **Full Automatic Assembly line (No Touch Technique)**

First Method: In this Method, Student first designs PCB and then use **CNC router for milling and engraving** so that the Circuit can be drawn on copper plate and drilling & milling can be done to mount the electronic components. Then chemical treatment of this PCB done and a green mask PCB is made.

Second Method: This is the semi automatic PCB manufacturing facility which includes all the First method process of designing on the computer with essential software's then cutting, milling process using CNC router & then using the stencils printer paste the SMD tin solder paste on the bare PCB after that then with the help of **Single Surface Mounting Machine** mount the essential SMD components on PCB.

Third Method: We have **Fully Automatic Surface Mounting Technology Industrial Level Lab** for manufacturing of any kind of **PCB for or Robotics Mechatronics, Quad Copters, UPS, Inverter etc.** where 72 types of SMD Components can be mounted in one go automatically with no touch technique.

The Context:

1. PCB manufacturing is the extended and enhanced field of Science and Technology which helps the students to develop life skills like Innovation, Creativity, Incubation and Entrepreneurship.
2. It helps to build robust cognitive learning teaching methodology to full fill the needs of mankind the work of Human beings.
3. This kind of Technology always promotes efficiency and accuracy in manufacturing technology so that manufacturing of **PCB from design to manufacturing helps in Automation, Robotic and Artificial Intelligence fields.**



4. This lab gives a chance to our students to learn the latest technologies and to prepare themselves for the futuristic ideas which are being adopted by industries for better productivity and efficiency and our idea is to teach all these technologies at college level only. So that, once they enter into field of **Artificial Intelligence, Machine Learning, Automation, Robotics, Electronic & PCB** manufacturing they are prepared to meet the industrial challenges.
5. PCB manufacturing lab relies on **STEM** learning i.e. Science Technology Engineering and Mathematics with the objective of focusing on improving student's logic and comprehension.
6. Arya College of Engineering and research Centre established the **PCB manufacturing lab** to fill the Institute Industry gap to inspire students towards Technology and to prepare them for the 4.0 Industrial revolution.

The Practice:

ACERC has been working in the field of **PCB manufacturing** for the last three years and has made many products like Robotic Arm, Hexapod, Spider Robot, Humanoid Robot etc.

For the overall development of the students the college is constantly training its students in its R&D & Innovative lab for integrating the knowledge of **PCB Electronic manufacturing, Robotics, Computer programming, Arduino & Raspberry Pi Programming, ROS (Robotic Operating System)** in order to enhance Student's skill set.

As of now, ACERC is working in the following area of technologies:

- SMT (Surface Mounting Technology) Technology
- Wave Soldering
- Robotic Manufacturing
- Pneumatic
- PCB Manufacturing
- Mechatronics
- Machine Learning
- Laser Cutting
- Humanoid
- FRP (Fiber Reinforce Plastic)
- Dip Soldering



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- CNC Cutting
 - Artificial Intelligence
 - 3D Printing
 - Stencil Formation.
 - IoT (Internet of Things)

In addition to learning engineering concepts, students develop valuable skills such as creativity, teamwork, design and problem solving, and this also helps to improve the analytical approach needed to define a appropriate strategic process.

Evidence of Success:

The students of Electrical Engineering, Civil Engineering and Computer Engineering came across to benefit from a harmonious joint venture between human staff and technology through in-house manufactured robots. Since introducing SMT Lab at ACERC, we have witnessed all these developments in the students.

The students became more involved in developing projects to participate and help the community- The students at ACERC have developed many projects such as Robocop, Ruby-the waitress robot, and sanitizer vending machines, etc. which solves day to day problems and help the community and society in general.

Improved teamwork and co-operative skills among students - When students work on a robotic project, they need to work in a group or a team as one can be useful in programming skill, but other parameters such as engineering, technology, and sensors are also crucial for building a robot. Hence, they need to collaborate with their team members in an open environment.

A Strong and robust curriculum helped create knowledgeable leaders for tomorrow - The ability to communicate across a platform with different groups helped the students show their personal strengths as individuals and how he/she is utilizing their positive traits to get a solution of the problem.

Problems Encountered and Resources Required:

- During the making of new products the major challenge that students faced was to make the Robots autonomous.
- During PCB manufacturing to procure the material and the Electronics components is the major challenge.
- Customization of the product as per the needs of the industry consumes a lot of time.
- Different projects done
- Participation in Innovative Ideas competition.
- Working on different technologies and development of products.