

# REFLECTIVE ELECTRICAL ENGINEERING LEARNING (REEL2026)

Building Skills and Professionalism through  
Industrial Training

# SKILLS



**REEL2026**  
Reflective  
Electrical Engineering Learning

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## BUILDING SKILLS AND PROFESSIONALISM THROUGH INDUSTRIAL TRAINING



## REEL 2026

### REFLECTIVE ELECTRICAL ENGINEERING LEARNING

*"Building Skills and Professionalism  
through Industrial Training"*

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Electrical Engineering Studies  
Universiti Teknologi MARA Pulau Pinang Branch  
Permatang Pauh Campus

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#### eISSN

3093-7027

#### Published by

Diploma in Electrical Engineering  
Electrical Engineering Studies  
Universiti Teknologi MARA Pulau Pinang Branch  
Permatang Pauh Campus  
13500 Permatang Pauh  
Pulau Pinang, Malaysia

**This e-magazine is published annually**

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*Reflection transforms  
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## Developing Technical Skills in PCB Manufacturing

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Before graduating with a Diploma in Electrical Engineering (Electronics), UiTM, all students are required to undergo industrial training at any company, whether government or private sector. I had the opportunity to undergo industrial training at AMC Cincaria Sdn. Bhd. Through this company, I gained a lot of experience and skills, especially skills in real-world electronics manufacturing. My participation in the PCB manufacturing process, from offline component preparation to final packaging, is the main topic of this reflective article. In my reflection, I address the technical difficulties faced, approaches to problem-solving, safety procedures, and the evolution of psychomotor abilities that have greatly aided in my professional development.

The production of PCB models was the focus of my everyday work. Begin with offline component preparation, electronic components such as capacitors, resistors and transistors were sorted. Following preparation, the PCBs moved to the Manual Insertion (MI) process.



Figure 1: Components Required for Insert on PCBs

Figure 1 above shows some capacitors and connectors needed during insertion process. I was tasked for placing these components onto the PCB according to the layout designed. Each component had a specific orientation.



Figure 2: Wave Soldering Machine

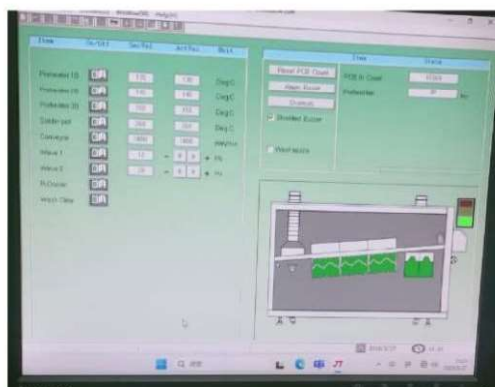


Figure 3: Process of Wave Soldering

After manual insertion, all assembled PCBs were placed into a magazine and transferred to the wave soldering machine. Wave Soldering Machine in Figure 2, perform soldering process in seconds what would take hours manually. Its consisted of several stages as shown in Figure 3:

1. **Flux Spraying:** The PCB was sprayed with flux to clean the metal surfaces and improve solder flow.
2. **Preheating:** To activate the flux and reduce thermal shock, the board pass through a heating zone.
3. **Soldering:** The PCB moved over a molten wave of solder, which adhered only to the exposed metal pads and component leads.
4. **Cooling:** Several fans cooled the board to solidify the solder joints.

During this process, I reflected on how automation increases consistency and output, but it also requires occasional maintenance and calibration.

The next stage was visual inspection and touch-up where all the PCBs from the wave soldering process are checked for solder shorts, insufficient solder, component misalignment and solder overflow. When defects were found, I learned to perform manual soldering using a soldering to remove excess solder. We cleaned the PCBs using isopropyl alcohol (IPA), followed by brushing and high-pressure air blowing to remove debris. Once the boards were cleaned and touched up, they proceeded to IC (Integrated Circuit) programming, where a programme was uploaded into the microcontroller as intended.



Figure 4: Example of IC Tester

Figure 4 shows one of the IC testers for PCBs to be tested on. Following programming, each board underwent an IC test using a dedicated tester model customized for that PCB. This was followed by a functional test (FCT) to verify that the PCB operated. During testing, I encountered several failures. Some boards failed due to solder short, minor scratches on PCB traces and misaligned components. Failed board was sent for rework. This taught me that small debris can cause the PCB to malfunction. These experiences show me the importance of cleanliness and thorough inspection in electronics manufacturing.

QA staff will review for final approval after the PCB passes all tests. Then, the packaging process is carried out where the packaging method varies by model, and it is necessary to ensure that all PCBs require Electrostatic Discharge (ESD) protection.



Figure 5: Static Shielding Bags

For example, in Figure 5 a static shielding bag is used to pack PCBs along with a silica gel pack to absorb moisture, then sealed the bag with a heat sealer. For smaller PCB models, we used anti-static bubble bags. This step taught me that protecting a product after manufacturing is equally important as manufacturing it correctly.

Several practical and industrial technical skills, especially those that cannot be acquired in the classroom, were developed through this industrial training. Through repeated manual insertion, precision soldering and board handling, I was able to improve my psychomotor skills. In addition, I was also given the opportunity to handle ESD sensitive components. Through this, I learned and gained awareness about quality systems such as traceability, inspection and rework loops, as well as the importance of safety and professionalism. This industrial training experience also made me realize that engineering requires lifelong learning. For example, to learn something, I must ask questions and learn from every failure. This industrial training not only builds practical skills but also builds a mindset for continuous professional development.

My industrial training experience at AMC Cincaria Sdn. Bhd. was transformative. Every stage, from manual component insertion to wave soldering, touch-ups, testing and packaging taught me about precision, patience and professionalism. Through some of the technical challenges I faced during this training such as short solder joints and misaligned components, it will help me become a more confident and efficient engineer in the future.

### Authors' Biography



**Muhammad Aiman bin Rosli** is a dedicated student pursuing Diploma in Electrical Engineering (Electronics) at Universiti Teknologi MARA (UiTM) Pulau Pinang. As part of his academic studies, he is currently undergoing internship at AMC Cincaria Sdn. Bhd. from 2nd March to 26th June 2026. This hands-on experience allows him to gain practical exposure to industrial practices in electronics manufacturing companies and further developing his technical skills.



**Shahilah binti Nordin** has 23 years of experience in electrical engineering field since she joined Universiti Teknologi MARA, Pulau Pinang in 2003. She received Bachelor of Engineering (Hons) (Electrical, Electronics and Systems) from Universiti Kebangsaan Malaysia, UKM in 1998 and was appointed as lecturer in Uniti College for 5 years. In 2000, she received Master of Engineering (Communication and System) from Universiti Kebangsaan Malaysia, UKM.

eISSN 3093-7027



PUBLISHED BY:  
DIPLOMA IN ELECTRICAL ENGINEERING  
ELECTRICAL ENGINEERING STUDIES  
UNIVERSITI TEKNOLOGI MARA (UiTM)  
PULAU PINANG BRANCH  
PERMATANG PAUH CAMPUS  
13500 PERMATANG PAUH  
PULAU PINANG