



E-PROCEEDINGS

INTERNATIONAL TINKER INNOVATION & ENTREPRENEURSHIP CHALLENGE (i-TIEC 2025)

"Fostering a Culture of Innovation and Entrepreneurial Excellence"



e ISBN 978-967-0033-34-1



23 January 2025
PTDI, UiTM Cawangan Johor
Kampus Pasir Gudang

ORGANIZED BY:

Electrical Engineering Studies, College of Engineering
Universiti Teknologi MARA (UiTM) Cawangan Johor
Kampus Pasir Gudang
<https://tieg-uitmpg.wixsite.com/tieg>

**E-PROCEEDINGS
of International Tinker Innovation & Entrepreneurship
Challenge (i-TIEC 2025)**



“Fostering a Culture of Innovation and Entrepreneurial Excellence”

**23rd JANUARY 2025
PTDI, UiTM Cawangan Johor, Kampus Pasir Gudang**

Organized by

Electrical Engineering Studies, College of Engineering,
Universiti Teknologi MARA (UiTM) Cawangan Johor, Kampus Pasir Gudang.
<https://tieg-uitmpg.wixsite.com/tieg>

Editors

Aznilinda Zainuddin
Maisarah Noorezam

Copyright © 2025 Universiti Teknologi MARA Cawangan Johor, Kampus Pasir Gudang, Jalan Purnama, Bandar Seri Alam, 81750 Masai Johor.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, whether electronic, mechanical, or otherwise, without prior written consent from the Undergraduate Coordinator, Electrical Engineering Studies, College of Engineering, Universiti Teknologi MARA (UiTM) Cawangan Johor, Kampus Pasir Gudang.

e ISBN: 978-967-0033-34-1

The author and publisher assume no responsibility for errors or omissions in this e-proceeding book or for any outcomes related to the use of the information contained herein.

The extended abstracts featured in this e-proceeding book have not undergone peer review or verification by i-TIEC 2025. The authors bear full responsibility for the content of their abstracts, guaranteeing that they are original, unpublished, and not concurrently submitted elsewhere. The opinions presented in the abstracts reflect those of the authors and do not necessarily align with the views of the editor.

Published in Malaysia by
Universiti Teknologi MARA (UiTM) Cawangan Johor
Kampus Pasir Gudang, 81750 Masai



CONTENTS

PREFACE	i
FOREWORD RECTOR	ii
FOREWORD ASSISTANT RECTOR	iii
PREFACE PROGRAM DIRECTOR	iv
ORGANIZING COMMITTEE	v
EXTENDED ABSTRACTS SCIENCE & TECHNOLOGY	1 - 618
EXTENDED ABSTRACTS SOCIAL SCIENCES	619 - 806

PREFACE

It is with great pleasure that we present the e-proceedings of International Tinker Innovation & Entrepreneurship Challenge (i-TIEC 2025), which compiles the extended abstracts submitted to the International Tinker Innovation & Entrepreneurship Challenge (i-TIEC 2025), held on 23 January 2025 at **PTDI, Universiti Teknologi MARA (UiTM) Cawangan Johor, Kampus Pasir Gudang**. This publication serves as a valuable resource, showcasing the intellectual contributions on the invention and innovation among students, academics, researchers, and professionals.

The International Tinker Innovation & Entrepreneurship Challenge (i-TIEC 2025), organized under the theme "Fostering a Culture of Innovation and Entrepreneurial Excellence," is designed to inspire participants at various academic levels, from secondary students to higher education students and professionals. The competition emphasizes both innovation and entrepreneurship, encouraging the development of product prototypes that address real-world problems and have clear commercialization potential. By focusing on technological and social innovations, i-TIEC 2025 highlights the importance of turning creative ideas into viable, market-ready solutions that can benefit users and society. The extended abstracts in this e-proceedings book showcase the diverse perspectives and depth of research presented during the event, reflecting the strong entrepreneurial element at its core.

We extend our sincere gratitude to the contributors for their dedication in sharing their innovation and the organizing committee for their hard work in ensuring the success of the event and this publication. We also appreciate the support of our collaborators; Mass Rapid Transit Corporation Sdn. Bhd. (MRT Corp), Universitas Labuhanbatu, Indonesia (ULB), Universitas Riau Kepulauan, Indonesia (UNRIKA) and IEEE Young Professionals Malaysia, whose contributions have been instrumental in making this event and publication possible.

We hope that this e-proceedings book will serve as a valuable reference for researchers, educators, and practitioners, inspiring further studies and collaborations in both innovation and entrepreneurship. May the knowledge shared here continue to spark new ideas and market-ready solutions, advancing our collective expertise and fostering the growth of entrepreneurial ventures.

B-ST010 - B-ST152

B-ST010: INDEPENDENT VARIABLES COMBINATION SELECTION USING BEST SUBSET SELECTION METHOD IN A MULTIPLE LINEAR REGRESSION BASELINE ENERGY MODEL FOR EDUCATIONAL BUILDING'S ENERGY CONSUMPTION PREDICTION	440
B-ST015: GEOPOBA AS A SOIL STABILIZATION MATERIAL	446
B-ST016: WASTE TO WEALTH UV LED ACRYLATED CURABLE COATING: A WASTE PALM COOKING OIL INNOVATION	450
B-ST024: SOLAR PANEL HOTSPOT DETECTOR.....	455
B-ST025: ERGO OPTIMA WORKSTATION FOR TERTIARY EDUCATION	462
B-ST030: EVENT CHECK-IN WEB APPLICATION (WEBAPP).....	469
B-ST048: DEVELOPMENT OF COST-EFFECTIVE ARDUINO-BASED OBJECT DETECTION AND COLOR SORTING WITH CONVEYOR SYSTEM FOR EXPERIENTIAL LEARNING IN AUTOMATION AND DIGITALIZATION.....	474
B-ST051: UNIVERSAL PLC TRAINER	479
B-ST066: HF-WIP: A MACHINE LEARNING APPROACH FOR BEHAVIORAL INSIGHTS AND SUSTAINABLE FOOD WASTE MANAGEMENT.....	483
B-ST080: DESIGN OF MONITORING AND CONTROL SYSTEM OF ELECTRICITY POWER LIMITER USING INTERNET OF THINGS.....	488
B-ST081: DESIGN OF MOBILE ROBOT FOR GAS AND TEMPERATURE DETECTION INSIDE TANKS BASED ON INTERNET OF THINGS	493
B-ST082: ELECTRIC BIKE USING RENEWABLE ENERGY CONCEPT	498
B-ST083: HIDROPONIC CONTROL SYSTEM USING INTERNET OF THINGS (IOT)	503
B-ST085: PH MEASUREMENT FOR WATERING PLANTS SYSTEM USING INTERNET OF THINGS (IOT).....	508
B-ST087: DETECTION AND MONITORING SYSTEM MATERIAL RACK LOCATION IN WAREHOUSE USING INTERNET OF THINGS	513
B-ST098: HYBRID OBSERVATION TECHNIQUE OF HILAL (HOTOH) 2.0: THE IMPLEMENTATION OF IMAGE PROCESSING TECHNIQUE FOR HILAL VISIBILITY DETECTION USING PYTHON	517
B-ST102: BLIND STICK WITH LED AND ULTRASONIC SENSOR TECHNOLOGY.....	525

B-ST051: UNIVERSAL PLC TRAINER

Ishak Taman¹ and Hanifah Jambari²

¹Department of Electrical Engineering, Politeknik Ibrahim Sultan, 81700 Pasir Gudang
Johor, Malaysia

² Department of Advanced Technical and Vocational Education and Training,
Faculty of Educational Sciences and Technology, Universiti Teknologi Malaysia,
Johor Malaysia

Corresponding author: ishak@pis.edu.my, hanifah-j@utm.my

ABSTRACT

The development of the Universal PLC Trainer aims to simplify and accelerate the understanding of fourth-semester students in the DEE and DJK programs enrolled in the DEJ40033 PLC & Automation course. This teaching kit is universal and portable, equipped with essential components for practical exercises in conventional wiring, PLC programming, electropneumatic, and industrial automation. Additionally, it features a Human Machine Interface (HMI) function to monitor input and output operations through controls such as touchscreen, voice control, and motion control. The HMI can also be programmed to display operation status using indicator lights, buzzers, and simulated LED displays. The kit is designed with a neat component layout, user-friendly interface, and high safety standards. Circuit connections are implemented via a plug and play system, making the process easier, faster, and safer. This innovation addresses the shortcomings of existing trainers, which are often disorganized, unsafe, and fail to meet practical syllabus requirements. The Universal PLC Trainer enhances the quality of teaching and learning, reduces instructional time, and improves students' comprehension. It is also cost-efficient, as its construction does not require additional external equipment. Students are more motivated as this learning method is engaging, portable, and systematically arranged according to theoretical topics. This innovation not only has a significant impact on students and lecturers but also holds potential for use by other organizations, such as Community Colleges, Vocational Colleges, and individuals interested in exploring the field of Programmable Logic Controllers (PLC). With the potential for broad application, the Universal PLC Trainer is a significant and innovative discovery in the field of engineering education and TVET.

Keywords: Universal PLC Trainer, Human Machine Interface (HMI), PLC programming, TVET

1. Product Description

The Universal PLC Trainer is a teaching aid product that combines three methods for conducting practical exercises related to PLC, hardwiring, and electropneumatic. The Universal PLC Trainer has dimensions of (56x80x4.5) cm. It is a portable teaching kit equipped with various tools and components such as an HMI, OMRON Programmable Logic Controller (CP1E), timer, counter, solid-state relay, sensors, start and stop buttons, a conveyor, and a complete set for an electropneumatic system. This includes an acting cylinder, solenoid valve, limit switch, air regulator filter, and terminals to facilitate circuit

connections and practical exercises. Each component is neatly arranged and user-friendly, based on high safety standards, giving it a unique edge compared to other teaching kits. All circuit connections can be executed using a plug-and-play system, allowing for easy, quick, and safe connections, as all main wiring is embedded within concealed sections.

2. Pictures and Flow Chart of the trainer



Figure 1a Exact Trainer

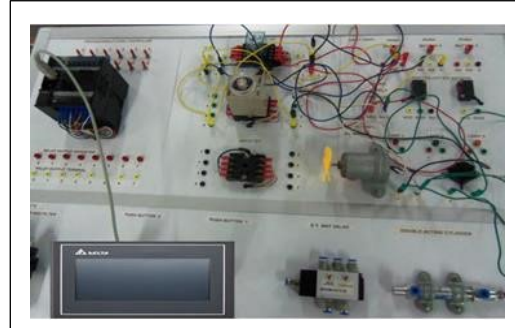


Figure 1b Modified trainer image redesigned as a universal PLC trainer

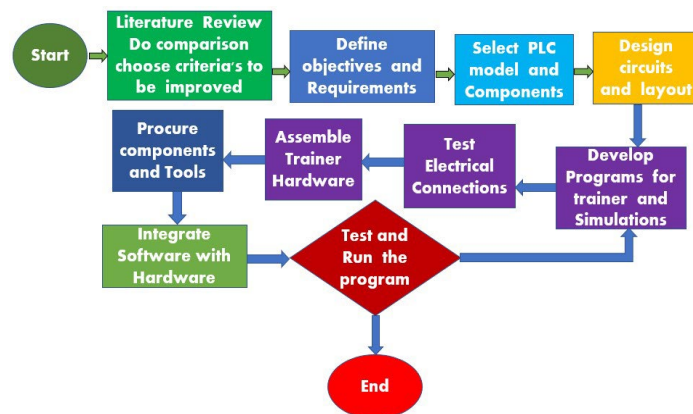


Figure 2. Flow chart

3. Novelty and uniqueness

The novelty of this trainer, which integrates PLC systems, electropneumatic, and hardwiring, lies in its ability to create a highly cohesive and adaptable automation system that is efficient and precise. The PLC serves as the central controller, overseeing and regulating processes, while electropneumatic actuators handle physical tasks such as moving components. Hardwiring ensures that all connections between parts are secure and dependable. Additionally, the uniqueness of the system is organized in a user-friendly manner, built to meet high safety standards, giving it a unique advantage over other teaching kits. With a plug-and-play setup, all circuit connections can be made quickly and safely, as the main wiring is discreetly concealed, ensuring both ease and security during the installation process.

4. Benefit to mankind

The benefits, impacts, and outcomes of the teaching trainer for practical work in Programmable Logic Controllers and electropneumatic are as follows:

i. Practical

This innovation is practical as it helps lecturers in the Department of Electrical Engineering improve the quality of teaching while contributing to new knowledge discovery and the development of a teaching kit.

ii. Time-Saving for Practical Implementation

It shortens the time needed to explain techniques for conducting practical, particularly those involving the connection of RLL/combinational/hardwire circuits and the integration of hardwiring with PLC programming.

iii. Simple Approach

The teaching process can be repeated until students fully understand the methods without burdening lecturers to repeatedly explain, as the connection and programming of PLC programs can be directly executed on the same trainer. Students only need to connect each circuit using the plug-and-play technique.

iv. Cost-Effective

This innovation reduces costs associated with purchasing and repairing equipment, as it is developed using the expertise of lecturers. It not only adheres to the taught syllabus but also serves as a trainer with universal features.

v. Enhances Motivation

Students are highly interested in and excited to conduct practical exercises due to the trainer's design, which is more focused on syllabus content with a systematic arrangement of components and improved safety features.

5. Innovation and Entrepreneurial Impact

The universal PLC trainer fosters innovation and supports a culture of entrepreneurship by providing hands-on learning experiences that bridge the gap between theoretical knowledge and real-world applications. By integrating PLC systems with electropneumatic and hardwiring, it enables students and professionals to explore automation technologies and develop practical skills crucial for modern industries. This exposure sparks creativity and problem-solving abilities, encouraging individuals to innovate and design custom solutions for various practical works. Furthermore, the trainer's versatility and ease of use make it an ideal tool for fostering entrepreneurship, allowing users to experiment with automation systems, refine their ideas, and even prototype new products. As a result, the universal PLC trainer contributes to a culture of continuous learning and development, empowering individuals to drive technological advancement within their communities, institutions, and industries, while also preparing them to meet the evolving demands of the workforce.

6. Potential commercialization

The development of this product, originally designed to meet the teaching needs of the DEJ40033 PLC and Automation course at Malaysian polytechnics, is expected to provide broader benefits. This product has the potential to be utilized by those enrolled in PLC courses at Community Colleges, Vocational Colleges, other TVET institutions, as well as individuals aiming to deepen their knowledge of Programmable Logic Controllers (PLC), hardwiring, and electropneumatic. This innovation can be further enhanced with improved components and functionality through adequate funding or resources, it could be marketed to TVET institutions and teaching centers which focused on industrial automation.

7. Acknowledgment

The authors would like to acknowledge the Deputy Director and Head of the Department of Electrical Engineering, Politeknik Ibrahim Sultan, as well as the Head of Department Advanced Technical and Vocational Education and Training, Faculty of Educational Sciences and Technology, Universiti Teknologi Malaysia for their invaluable support and encouragement throughout the development of this innovation. Their support and commitment have played a crucial role in the success of the Universal PLC Trainer as a teaching and learning aid.

8. Authors' Biography



Mr Ishak Taman is a Senior lecturer in the Department of Electrical Engineering at Politeknik Ibrahim Sultan, Johor. He has 22 years of experience teaching courses in Programmable Logic Controller (PLC), Final Project and electrical wiring. Besides teaching, he is also involved in writing and publishing journals and research papers. Additionally, he frequently serves as a judge for innovation competitions, both at the internal and international levels. He has successfully been awarded a TARGS grant for the development of a Compost Fertilizer Machine by the Pusat Penyelidikan dan Inovasi, JPPKK



Hanifah Jambari received her B.E. (Electrical) degree from Universiti Teknologi Mara Shah Alam, the M. Ed (Technical) and PhD in Electrical Engineering degrees from Universiti Teknologi Malaysia in 1996, 2001 and 2014 respectively. She is currently an Associate Professor at Department of Advanced Technical and Vocational Education and Training, Faculty of Educational Sciences and Technology Universiti Teknologi Malaysia (UTM), Johor, Malaysia. Her research interests include areas of technical and vocational education, engineering education, electrical engineering, special needs education, power electronics and food technology.