

# Proceeding of International University Carnival on E-Learning



INTERNATIONAL UNIVERSITY CARNIVAL ON E-LEARNING

*“ Embracing AI for  
Innovative Learning and  
Inclusive Education ”*

Chief Editor  
Loh Ser Lee

Editors  
Nur Zareen Zulkarnain  
Safiza Suhana Kamal Baharin  
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**Penerbit UTeM Press**

Universiti Teknikal Malaysia Melaka

2026

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eISBN: 978-629-7892-04-7

FIRST PUBLISHED 2026

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Member of the Malaysian Scholarly Publishing Council (MAPIM)  
Member of the Malaysian Book Publishers Association (MABOPA)  
Member of Clarivate Analytics

**Published and Printed in Malaysia by**  
Penerbit UTeM Press  
Universiti Teknikal Malaysia Melaka  
Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia.  
Tel: +606 229 2133    Faks: +606 229 2433



Cataloguing-in-Publication Data

National Library of Malaysia

A catalogue record for this book is available  
from the National Library of Malaysia

eISBN 978-629-7892-04-7

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## **Preface**

We are pleased to present the e-Proceedings of the International University Carnival on E-Learning 2025 (IUCEL2025), organised by the Centre for Open and Distance Learning (CODL), Universiti Teknikal Malaysia Melaka (UTeM), in collaboration with the Ministry of Higher Education Malaysia (MoHE). The event was supported by the Department of Higher Education, MoHE, and the Public University e-Learning Council (MEIPTA).

Held on 13 November 2025, IUCEL2025 brought together 196 e-learning innovators from 26 institutions. All presenters were invited to submit extended abstracts in August 2025. After a thorough evaluation and peer-review process completed in September 2025, a total of 160 articles were accepted for inclusion in this publication. The papers compiled here represent diverse perspectives and practices aligned with the event's theme, *“Embracing AI for Innovative Learning and Inclusive Education.”*

We extend our sincere appreciation to all authors for their valuable contributions, as well as to the panel of reviewers for their time and expertise. Special acknowledgement is also extended to the Patron of IUCEL2025, Professor Datuk Ts. Dr. Massila binti Kamalrudin, and Chairman, Professor Ir. Dr. Gan Chin Kim, for their leadership and guidance throughout the preparation of this event.

We also express our heartfelt gratitude to the CODL and UTeM team members whose dedication made this publication possible. We hope that the research and ideas presented in this e-proceedings will serve as a meaningful reference for educators, researchers, and practitioners committed to advancing e-learning innovation.

## **Editors**

IUCEL2025 E-Proceedings

## Foreword

As Patron of the International University Carnival on E-Learning 2025 (IUCEL2025), I am pleased to present this e-proceedings, which reflects Universiti Teknikal Malaysia Melaka's (UTeM) continued commitment to advancing innovation in digital learning. In collaboration with the Ministry of Higher Education Malaysia (MoHE), IUCEL2025 stands as a testament to our aspiration to nurture a progressive and inclusive educational ecosystem enriched by emerging technologies.

The theme, "*Embracing AI for Innovative Learning and Inclusive Education,*" captures the spirit of transformation shaping higher education today. Artificial intelligence, when applied thoughtfully, has the capacity to broaden access, personalise learning experiences, and strengthen teaching effectiveness across diverse disciplines. IUCEL2025 offered a valuable avenue for educators, researchers, and practitioners to reflect on these opportunities and share meaningful insights that will guide the future of e-learning in Malaysia and beyond.



I would like to express my appreciation to all contributors who have shared their work in this publication. My gratitude also goes to the organising committee members, especially those from Centre for Open and Distance Learning (CODL), for their dedication in ensuring the success of IUCEL2025.

I hope that this e-proceedings will serve as a useful resource and inspire continued exploration, collaboration, and innovation in the pursuit of excellence in teaching and learning.

**PROFESSOR DATUK TS. DR. MASSILA BINTI KAMALRUDIN**

Vice-Chancellor

Universiti Teknikal Malaysia Melaka (UTeM)

Patron, IUCEL2025

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# A CONCEPTUAL FRAMEWORK FOR INCLUSIVE LEARNING IN CIRCUIT THEORY I USING AI AND DIGITAL SIMULATIONS

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## Abstract

*This study proposes a conceptual framework for inclusive learning in Chapter 2 of Circuit Theory I; Basic Laws. As the foundation for advanced topics and subsequent courses such as Circuit Theory II, mastery of the concepts in this chapter is crucial for student progression. The framework redesigns traditional teaching by incorporating artificial intelligence (AI), digital simulations, and a flipped learning approach to address diverse learning challenges and improve conceptual understanding. The methodology combines simulation platforms (Multisim or LTSpice) with Snorkl AI applications to create an adaptive, feedback-driven learning environment. Students are introduced to key theories through pre-class materials and guided modules, followed by hands-on live demonstrations using both real circuits and software simulations. Snorkl AI provides real-time feedback, adaptive questioning, and personalized recommendations, ensuring that learners with varying abilities can progress at their own pace. This integration of flipped learning, digital simulations and AI-supported feedback aims to bridge the gap between theory and practice, while maintaining inclusivity in the classroom. Although this framework remains a proposed concept, its anticipated outcomes include improved comprehension of fundamental circuit laws, enhanced student engagement, and better preparedness for more advanced circuit analysis. In conclusion, this conceptual framework highlights how the strategic combination can transform the teaching of basic circuit theory into a more inclusive, engaging, and effective experience.*

**Keywords:** Adaptive Learning, Artificial Intelligence, Circuit Theory, Flipped-Learning, Inclusive Learning

## BACKGROUND OF THE INNOVATION IN TEACHING & LEARNING DESIGN

The Circuit Theory I course is a compulsory subject for Year 1 students in the Bachelor of Electrical and Electronics Engineering program at the Faculty of Engineering, Universiti Malaysia Sarawak. It is widely recognized as a challenging course, as it requires students to translate abstract theoretical concepts into practical applications (Fayyaz & Trueman, 2022).

Traditionally, the course has been taught through lectures, assignments, and written examinations. However, this approach often falls short in addressing the diverse learning needs of students, particularly those with varying levels of cognitive ability, learning styles, and prior

knowledge. Many students struggle with its mathematical nature and the lack of hands-on visualization, which contributes to inconsistent learning outcomes.

The rising demand for inclusive and adaptive learning highlights the need for a more engaging and supportive approach. To respond to this challenge, the proposed innovation introduces a redesigned teaching framework that integrates artificial intelligence (AI), digital simulations and flipped learning strategies.

The integration of digital tools can foster a more engaging learning environment, which has been shown to enhance student confidence and performance (Pitterson, 2023; Salas-Rueda & Ramirez-Ortega, 2021). Moreover, the necessity for adaptive learning frameworks is supported by findings that highlight the importance of catering to diverse learning preferences to promote better educational outcomes (Hu & Guo, 2023; Behara et al., 2023). This framework aims to lower barriers to understanding, foster active participation, and build a stronger foundation for student success in subsequent engineering courses.

**DESCRIPTION OF THE INNOVATION IN TEACHING & LEARNING DESIGN**

The proposed framework redesigns the teaching of Chapter 2 in Circuit Theory I (Basic Laws) through a combination of flipped learning, AI integration, and digital simulations. The session of the class is divided into three sessions as per shown in Figure 1(a)-(c).



**Figure 1:** Implementation of the session (a) Session 1 (b) Session 2 (c) Session 3

From the figures, it can be observed that pre-class activities introduce students to Ohm's Law, Kirchhoff's Laws, and related concepts through structured modules, ensuring baseline familiarity before class. In-class sessions focus on active engagement, including live demonstrations using real circuits as well as digital simulations via Multisim and LTSpice.

To enhance inclusivity, the framework incorporates Snorkl AI applications that provide real-time feedback, adaptive questioning, and personalized guidance based on each learner's progress. This ensures that students with varying abilities and learning speeds receive targeted support. By combining flipped learning with AI-powered analytics and interactive simulations, the design bridges theoretical content with hands-on practice, creating a holistic and adaptive learning environment.

### **SIGNIFICANCE OF THE INNOVATION**

This framework is significant as it directly addresses longstanding challenges in teaching basic circuit theory, where students often struggle to connect mathematical derivations with real-world applications. By employing an inclusive, technology-enhanced approach, the framework not only improves conceptual understanding but also reduces disparities among learners. The innovation introduces a new pedagogical design for engineering education that is scalable, replicable, and adaptable to various classroom contexts, particularly in institutions seeking to modernize their teaching practices.

### **IMPACT OF THE INNOVATION TOWARDS EDUCATION OR COMMUNITY**

This framework has the potential to transform how foundational engineering concepts are taught by making learning more inclusive, engaging and adaptive. By addressing diverse learning needs through AI feedback, flipped learning and simulations, it can reduce student failure rates and build stronger foundations for future courses. The innovation also equips students with practical problem-solving skills and confidence in applying theory to real-world circuits. Beyond the classroom, it contributes to producing more competent engineering graduates who can better meet industry and societal needs.

### **COMMERCIALIZATION POTENTIAL**

This framework can be developed into a digital learning package with AI feedback and simulation tools. It has potential for adoption by universities and training centers, with opportunities for licensing, integration into LMS, or subscription-based platforms.

### **CONCLUSION**

In summary, this proposed framework demonstrates how flipped learning, AI and digital simulations can be strategically combined to improve inclusivity, engagement and effectiveness in teaching basic circuit laws. While still at the conceptual stage, it provides a clear direction for rethinking traditional approaches to engineering education. With further development and implementation, the design can serve as a model for innovative teaching practices that strengthen student outcomes and enhance educational quality.

**Acknowledgement:** The authors would like to express their appreciation to Faculty of Engineering, Universiti Malaysia Sarawak, UNIMAS Leadership Centre (ULC) and Centre for Flexible Learning UNIMAS (C-Flex) for the support of the project.

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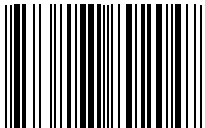
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e ISBN 978-629-7892-04-7



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