Assessing Graduate Achievement and Professional Competencies through PEO Attainment in TVET Education

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Abstract— **This study presents the assessment of Programme Educational Objectives (PEOs) attainment for the Diploma in Electrical Engineering (DET) programme at Politeknik Premier Kota Bharu, conducted in accordance with Outcome-Based Education (OBE) principles and accreditation requirements. The study evaluates graduates' career and professional achievements three to five years after graduation, focusing on the 2021 cohort. A total of 124 out of 144 graduates responded to a structured online survey, representing a high response rate of 86.1%, which exceeds institutional benchmarks and the recommended sample size. The assessment covers four PEO domains: technical competency (PEO1), professional ethics and societal responsibility (PEO2), entrepreneurial and innovation engagement (PEO3), and continuous professional development (PEO4). The findings indicate that all PEOs have successfully achieved their respective targets. PEO1 recorded an attainment of 90.3%, reflecting strong employability and technical capability among graduates. PEO2 achieved 98.4%, demonstrating excellent ethical conduct and societal contribution. PEO3 attained 42.7%, slightly exceeding the target and indicating moderate involvement in entrepreneurial and innovation-related activities. Meanwhile, PEO4 recorded 73.4%, showing good engagement in lifelong learning and career advancement. Overall, the results confirm the effectiveness of the DET programme in producing competent, ethical, and industry-relevant graduates. However, the study highlights the need to further enhance entrepreneurial participation and strengthen continuous professional development initiatives. The findings provide valuable input for continuous quality improvement (CQI) efforts to ensure sustained programme relevance and alignment with evolving industry demands.**

Keywords— **Programme Educational Objectives, Outcome-Based Education, TVET Graduates, PEO Attainment, Graduate Employability**

I. INTRODUCTION

Outcome-Based Education (OBE) has become an important approach in higher education to ensure that academic programmes produce graduates who are competent, industry-relevant, and capable of contributing effectively to society. In engineering and Technical and Vocational Education and Training (TVET) education, greater emphasis has been placed on evaluating graduates' long-term achievements to support graduate employability, curriculum relevance, and continuous quality improvement (CQI) initiatives [1],[2],[3],[4]. As part of this approach, higher education institutions are required to continuously assess the effectiveness of their academic programmes in achieving the intended educational outcomes.

One of the important elements in OBE assessment is the evaluation of Programme Educational Objectives (PEOs), which describe the expected career and professional accomplishments of graduates within three to five years after graduation. The assessment of PEO attainment provides an indicator of how effectively a programme prepares graduates for professional practice, lifelong learning, and societal contributions. In Malaysia, the implementation and evaluation of PEOs, particularly in engineering programmes, are aligned with the guidelines established by the Board of Engineers Malaysia (BEM) and the Engineering Technology Accreditation Council (ETAC). To ensure a more comprehensive and objective evaluation, the assessment process also incorporates feedback from relevant stakeholders, including graduates and employers [4],[5].

In line with these requirements, the Diploma in Electrical Engineering (DET) programme offered by the Department of Electrical Engineering (JKE), Politeknik Premier Kota Bharu (PKB) has established four Programme Educational Objectives aimed at producing competent and versatile TVET graduates who are capable of contributing effectively to the workforce and society. The PEOs are defined as follows:PEO1:

Practicing as technicians in electrical engineering–related fields PEO2: Contributing to society with professional ethics and responsibilities

PEO3: Engaging in enterprising activities that apply engineering knowledge and technical skills PEO4: Engaging in activities to enhance knowledge for successful career advancement

Based on these established objectives, this report focuses on the assessment of PEO attainment for the DET programme. The assessment provides insights into the extent to which the programme successfully equips graduates with the intended knowledge, technical competencies, professional values, and career development capabilities in meeting current industry and societal needs.

II. METHODOLOGY

This study targeted graduates from the JKE PKB, who completed their studies in 2021. Table 1 presents the total number of graduates, the number of respondents, and the percentage of respondents for the DET programme. In 2021, a total of 144 students graduated from the DET programme. Of these, 124 graduates responded to the instrument, representing 86.1% of the total population. This response rate exceeds the 70% target set by the Jabatan Pendidikan Politeknik dan Kolej Komuniti (JPPKK). In addition, the number of respondents surpasses the minimum sample size recommended by the Krejcie and Morgan table. For a population size of N = 150, the table suggests a minimum sample size of S = 108 respondents. Therefore, the number of responses obtained is considered adequate to generate statistically meaningful results [6],[7],[8],[9].

TABLE 1

NUMBER AND PERCENTAGE OF RESPONDENTS FOR THE PEO STUDY OF THE DET PROGRAMME

Total Graduates	144
Number of Respondents	124
Percentage of Respondents	86.1%

To fulfil this study, an online survey was administered via Google Forms to facilitate accessibility and improve the response rate. As agreed during the PEO study implementation meeting, the instrument was distributed to graduates for approximately two months, from February to March 2026. Multiple strategies were employed to trace and engage respondents, including contact through former academic advisors, the alumni database, social media platforms (e.g., Facebook and Instagram), WhatsApp groups, and direct phone calls. Despite these efforts, some graduates remained unreachable due to:

i. inactive phone numbers of graduates or their next of kin

ii. graduates changing their phone numbers

iii. graduates losing contact with peers

iv. graduates being unavailable due to police or military recruitment training

Based on the four PEOs, a set of questionnaire surveys was developed and distributed to all graduates. The indicators and variables measured in the questionnaire are presented in Table 2. For each PEO, three questions were included in the instrument, and respondents were required to select either “Yes” or “No” for each question. A graduate is considered to have attained a particular PEO if at least one of the responses for the respective PEO evaluation is “Yes”. However, for the third question under the measurement of PEO4, respondents were allowed to select more than one option to indicate their achievements to date.

TABLE 2
INSTRUMENT INDICATOR AND VARIABLES

PEO 2019	Indicator / Variable measured	Questions / Instrument
PEO1: Practicing technician in electrical engineering related field	Work in Field	1. Are you working / have you ever worked in electrical / electronic engineering related field? (Yes / No) 2. Have you ever applied / practiced any electrical/electronic knowledge in your job scope? (Yes / No) 3. Are you able to perform technical tasks in the field of electrical / electronic engineering effectively? (Yes / No)
PEO2: Contributing to society with professional ethics and responsibilities	Role of Graduates	1. Are you practice ethical conduct and professional responsibility when working in a team at an educational institution or in the workplace? (Yes / No) 2. Are you a member of any professional body or international society or regulatory body (e.g.: BEM/ MBOT/ IEEE / IEM/ MySet/ CIDB/NIOSH)? (Yes / No) 3. Have you ever involved in any community or social activities (e.g.: communal work / Corporate Social Responsibility activities / social work / NGOs)? (Yes / No)
PEO3: Engaging in enterprising activities that apply engineering knowledge and technical skills	Enterprising Activities, Research and Development (R&D)	1. Have you ever engaged in entrepreneurship activities in the field of electrical / electronic engineering, either full-time or part-time, online or offline? (Yes / No) 2. Have you ever been involved in research and development (R&D) of any product / service/ system / technical project? (e.g., market research, product quality improvement, business innovation, process improvement, design) (Yes / No) 3. Have you ever participated in seminars, conferences, workshops, or competitions promoting entrepreneurship / research and development (R&D) / innovation in the field of electrical / electronic engineering? (Yes / No)
PEO4: Engaging in activities to enhance knowledge for successful career advancement	Activities Enhancing Knowledge	1. Have you ever participated in any courses or activities to enhance your knowledge of new technology? (Yes / No) 2. Do you hold any professional certification? (Yes / No) 3. What are your achievements to date? *You can select more than one answer option: • Salary increases • Promotion • Own business • Further education • Not applicable

Upon obtaining the results, statistical analysis was conducted on the collected data. The quantitative data were analysed and presented using graphs and charts to determine the percentage distribution of various elements of the PEOs. This analysis serves as a guideline for identifying the most significant elements of the PEOs and supports continuous quality improvement in the engineering programme's education system [3].

Nevertheless, to improve the validity and reliability of the study findings, data triangulation is also applied to check the validity of the data or the information obtained. Therefore, in addition to using the questionnaire method as a data collection process, this study also collected some relevant data for analysis from annual discussion session with programme advisory committee from industries and polytechnic alumni.

For this cohort, each PEO is required to meet a specified target. The targets were predetermined based on the average trend of PEO attainment over the past three years and were subsequently validated through a triangulation process to ensure their appropriateness and reliability [2],[10]. Table 3 presents the targets that was determined in the Programme Advisory Committee Meeting.

TABLE 3

PEO 2019	DET Calculated Target	Target for DET
PEO1: Practicing technician in electrical engineering related field	77.4%	At least 50% of the graduates' work as technicians in any industry with job function in electrical or electronic discipline.
PEO2: Contributing to society with professional ethics and responsibilities	98.6%	At least 70% of the graduates are involved in community activities which includes engineering and non-engineering work related to society, health and safety.
PEO3: Engaging in enterprising activities that apply engineering knowledge and technical skills	53%	At least 40% of the graduates will be involved in enterprising activities.
PEO4: Engaging in activities to enhance knowledge for successful career advancement	74.3%	At least 50% of the graduates will either further study, self-employed, hold senior position post, involved in technical project or in R&D activities.

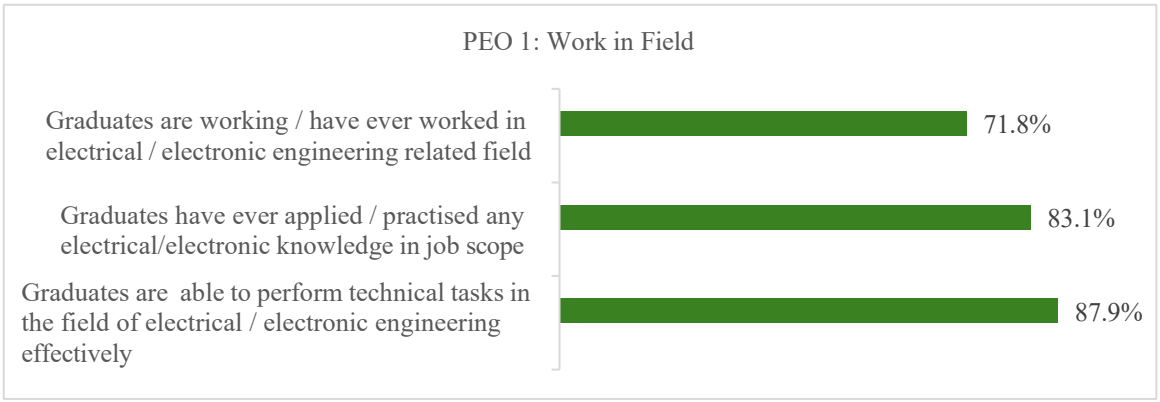
PEO ATTAINMENT TARGETS ESTABLISHED IN THE PROGRAMME ADVISORY COMMITTEE MEETING

III. RESULT AND DISCUSSION

The results of the study and the discussion of the findings are presented according to the respective PEOs being evaluated. The findings for each PEO are presented based on the percentage of respondents, which are illustrated using charts and tables.

PEO1: Practicing technician in electrical engineering related field

The attainment of PEO1 is measured based on the percentage of DET graduates who are working in electrical/electronic-related fields or who apply electrical/electronic knowledge in their job scope after graduation. Based on the bar chart in Fig. 1, 71.8% of the respondents are currently working or have previously worked in electrical or electronic engineering-related fields. These fields include engineering, manufacturing, transportation services, and telecommunications.



In addition, 83.1% of the respondents reported that they have applied or practiced electrical/electronic knowledge in their job scope. Meanwhile, 87.9% of the respondents indicated that they are able to perform technical tasks in the field of electrical or electronic engineering effectively.

Fig. 1 Percentage of Attainment for Each PEO1 Item

This contributes to the attainment of PEO1 for the DET programme at 90.3%, as shown in Table 4, exceeding the established target of 50%. The result reflects a high level of attainment for PEO1, where the majority of respondents have secured employment in technical-related fields and are able to perform responsibilities associated with technician roles. This indicates that the programme has successfully equipped its graduates with the technical competencies required by the industry [2],[4].

Table 4
PEO1 AttainmeNT

PEO	Questions		% Yes	% PEO Attainment
PEO 1	Question 1	Graduates are working / have ever worked in electrical / electronic engineering related field	71.8%	90.3%
	Question 2	Graduates have ever applied / practiced	83.1%	
	Question 3	Graduates are able to perform technical tasks in the field of electrical / electronic engineering effectively	87.9%	

PEO2: Contributing to society with professional ethics and responsibilities

PEO2 measures the roles and responsibilities of graduates as well as their contributions to society with professional ethics. The attainment of PEO2 was measured using three items, as shown in Fig. 2. The results indicate that 98.4% of respondents practice ethical conduct and professional responsibility when working in a team at an educational institution or in the workplace. In addition, 37.1% of the respondents reported that they are members of professional bodies, international societies, or regulatory organizations such as BEM, MBOT, IEEE, IEM, MySet, and CIDB.

The role of graduates in society was also assessed, where 66.1% of the respondents have been involved in community or social activities such as communal work, Corporate Social Responsibility (CSR) programmes, social work, or non-governmental organizations (NGOs).

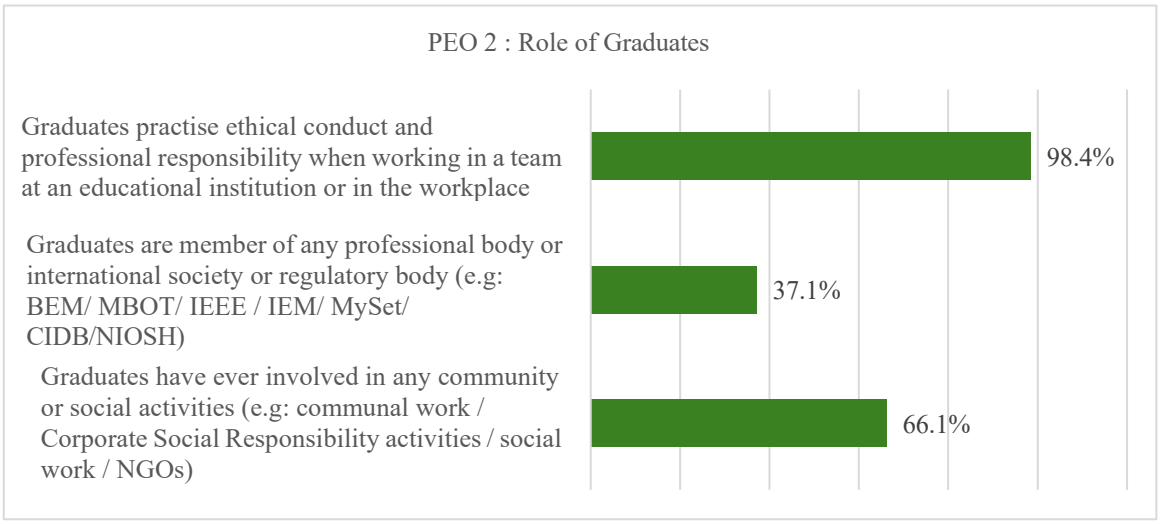


Fig. 2 Percentage of Attainment for Each PEO2 Item

Overall, these items contributed to the attainment of PEO2 for the DET programme at 98.4%, as presented in Table 5, which exceeds the target attainment level of 70%. This result indicates an excellent level of attainment for PEO2, demonstrating that the values of social responsibility and professional ethics have been successfully instilled during the programme and are sustained in the graduates' professional careers [2].

Table 5
PEO2
Attainment

PEO	Questions		% Yes	% PEO Attainment
PEO 2	Question 1	Graduates practise ethical conduct and professional responsibility when working in a team at an educational institution or in the workplace	98.4%	98.4%
	Question 2	Graduates are members of any professional body or international society or regulatory body (e.g.: BEM/ MBOT/ IEEE / IEM/ MySet/ CIDB/NIOSH)	37.1%	
	Question 3	Graduates have ever been involved in any community or social activities (e.g.: communal work / Corporate Social Responsibility activities / social work / NGOs)	66.1%	

PEO3: Engaging in enterprising activities that apply engineering knowledge and technical skills

PEO3 measures the involvement of graduates in entrepreneurial activities as well as research and development (R&D) initiatives that apply engineering knowledge and technical skills. Based on the chart shown in Fig. 3, 32.3% of the respondents reported that they have engaged in entrepreneurship activities in the field of electrical or electronic engineering, either full-time or part-time, through online or offline platforms.

Meanwhile, 25.8% of the respondents indicated that they have been involved in research and development (R&D) related to products, services, systems, or technical projects, such as market research, product quality improvement, business innovation, process improvement, and design. In addition, 29.8% of the respondents have participated in seminars, conferences, workshops, or competitions that promote entrepreneurship, research and development (R&D), or innovation in the field of electrical or electronic engineering.

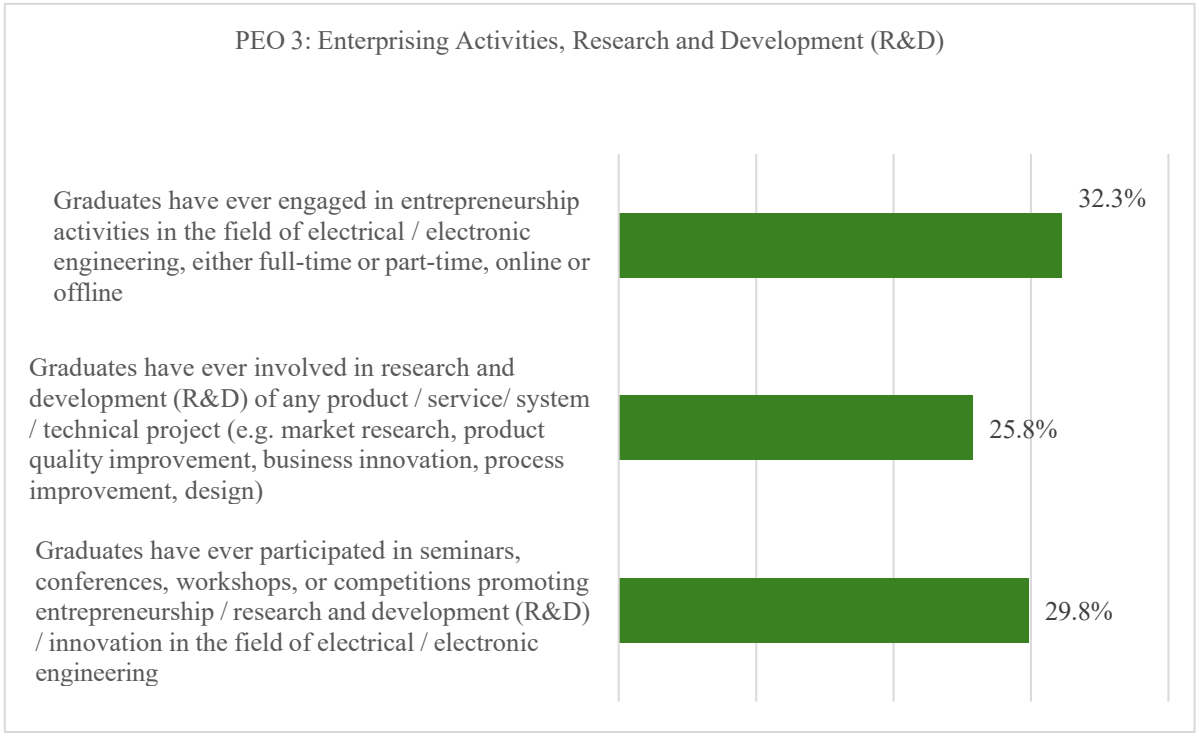


Fig. 3 Percentage of Attainment for Each PEO3 Item

Overall, these items contributed to the attainment of PEO3 for the DET programme at 42.7%, as illustrated in Table 6. This value exceeds the established target attainment level of 40%. The findings indicate that a proportion of the graduates are involved in entrepreneurial initiatives, innovation, and research-related activities that apply their engineering knowledge and technical skills. These results suggest that the programme has provided graduates with a foundation to explore entrepreneurial opportunities and participate in activities that promote innovation and technological development [3]. However, the attainment of PEO3 can be further strengthened, particularly in encouraging graduates to venture into entrepreneurship within the electrical and electronic field through enhanced training and greater entrepreneurial support within the DET programme.

Table 6
PEO3 AttaiNMENT

PEO	Questions		% Yes	% PEO Attainment
PEO 3	Question 1	Graduates have ever engaged in entrepreneurship activities in the field of electrical / electronic engineering, either full-time or part-time, online or offline	32.3%	42.7%
	Question 2	Graduates have ever involved in research and development (R&D) of any product / service/ system / technical project (e.g. market research, product quality improvement, business innovation, process improvement, design)	25.8%	
	Question 3	Graduates have ever participated in seminars, conferences, workshops, or competitions promoting entrepreneurship / research and development (R&D) / innovation in the field of electrical / electronic engineering	29.8%	

PEO4: Engaging in activities to enhance knowledge for successful career advancement

PEO4 measures the involvement of graduates in activities that enhance their knowledge as well as their career advancement. Referring to Fig. 4, 66.9% of the respondents reported that they have participated in courses or activities to enhance their knowledge of new technologies. Meanwhile, 35.5% of the respondents indicated that they hold professional certifications.

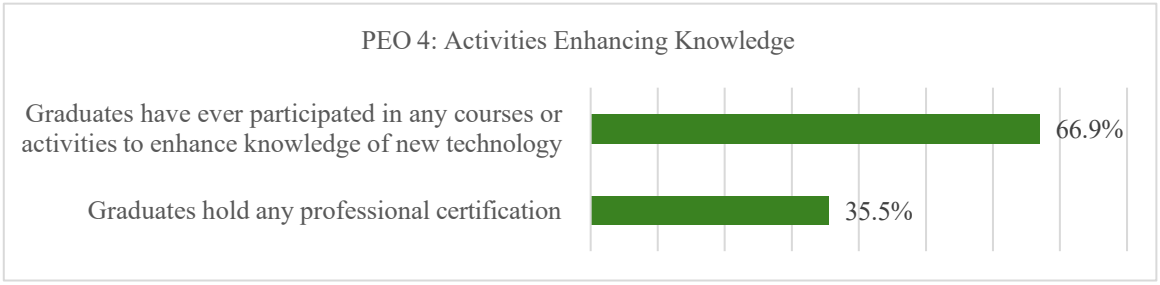


Fig. 4 Percentage of Attainment for Each PEO4 Item

In terms of career achievements to date, as presented in Fig. 5, 69.4% of the respondents reported receiving salary increases, while 29.8% have obtained promotions. In addition, 12.9% of the respondents have started their own businesses, and 18.5% have pursued further education. Only 8.1% of the respondents indicated “not applicable.”

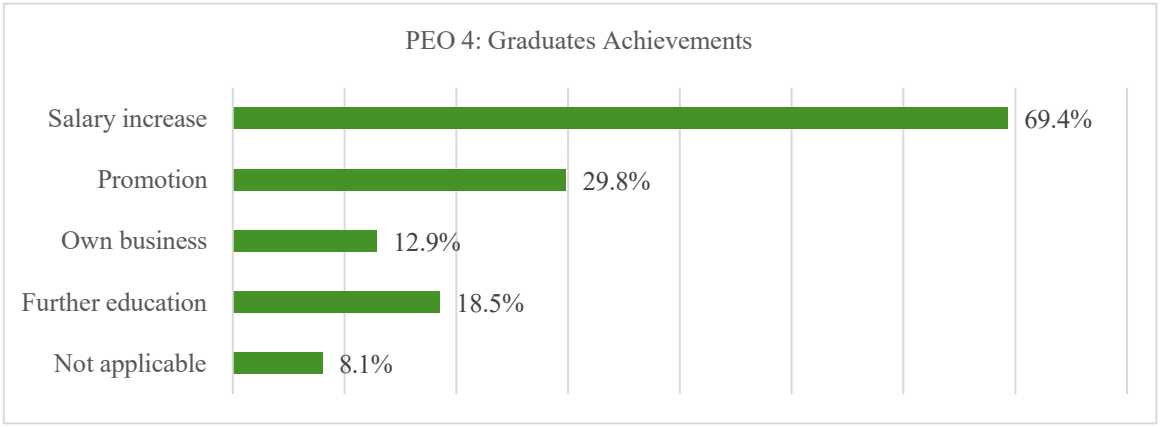


Fig. 5 Percentage of Attainment for Graduates Achievement in PEO4 Item

Overall, these findings contributed to the attainment of PEO4 for the DET programme at 73.4%, as presented in Table 7, exceeding the established target of 50%. This indicates that PEO4 has been achieved at a good level, suggesting that many graduates continue to enhance their knowledge and professional competencies to support their career development [1],[3].

Table 7
PEO4 Attainment

PEO	Questions			% Yes	% PEO Attainment
PEO 4	Question 1	Graduates have ever participated in any courses or activities to enhance knowledge of new technology		66.9%	73.4%
	Question 2	Graduates hold any professional certification		35.5%	
	Question 3	Graduates' achievements to date	Salary increases	69.4%	
			Promotion	29.8%	
			Own business	12.9%	
			Further education	18.5%	
			Not applicable	8.1%	

IV. CONCLUSIONS

Overall, as shown in Fig. 6, the attainment of PEO1 (90.3%) and PEO2 (98.4%) exceeded their respective targets (50% and 70%), indicating strong performance in technical practice and ethical responsibility. PEO3 (42.7%) slightly surpassed the target of 40%, suggesting moderate involvement in entrepreneurial and innovation-related activities. Meanwhile, PEO4 (73.4%) exceeded the target of 50%, demonstrating good engagement in continuous learning and professional development. These findings confirm the effectiveness of the programme in achieving the intended educational objectives in producing graduates with strong technical competencies, professional ethics, and continuous development capabilities. These findings also provide useful input for CQI of the programme [3],[4].

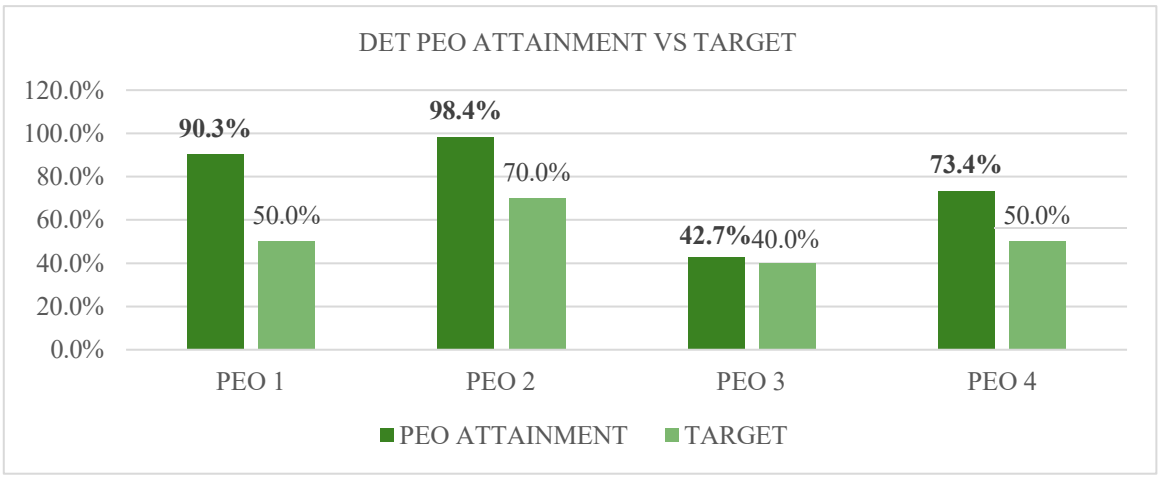


Fig. 6 PEO Attainment vs Target

To further enhance the attainment of PEOs, several improvement initiatives are recommended. Firstly, efforts to strengthen entrepreneurial and innovation engagement (PEO3) can be enhanced through structured programmes such as industry-based projects, start-up incubation, innovation competitions, and collaboration with industry partners.

Secondly, to improve continuous professional development (PEO4), graduates should be encouraged to pursue professional certifications, lifelong learning courses, and active participation in professional bodies through incentives or structured pathways. In addition, stronger industry collaboration can be established to ensure curriculum relevance and provide more exposure to real-world applications. Continuous engagement with alumni and employers should also be strengthened to obtain more comprehensive feedback for future PEO assessments [2],[3]. These initiatives are expected to further improve graduate outcomes and support CQI of the programmes.

Table 8 presents a summary of the overall attainment of each PEO compared against its respective target, providing an overview of the programme's performance in achieving its intended educational outcomes.

TABLE 8

PEO ATTAINMENT FOR DET

No	PEO	Target	PEO Attainment	Remark
1	Practicing technician in electrical engineering related field	At least 50% of the graduates' work as technicians in any industry with job function in electrical or electronic discipline.	90.3%	Target achieved
2	Contributing to society with professional ethic and responsibilities	At least 70% of the graduates involve in community activities which includes engineering and non-engineering work related to society, health and safety.	98.4%	Target achieved

3	Engaging in enterprising activities that apply engineering knowledge and technical skills	At least 40% of the graduates will be involved in enterprising activities.	42.7%	Target achieved
4	Engaging in activities to enhance knowledge for successful career advancement	At least 50% of the graduates will either further study, self-employed, holding senior position post, involved in technical project or in R&D activities.	73.4%	Target achieved

In summary, the findings show that the DET programme has successfully equipped graduates with the required technical skills, ethical values, and professional competencies, while highlighting areas—particularly entrepreneurial engagement (PEO3)—that can be strengthened through targeted training and support initiatives. These results provide valuable guidance for continuous quality improvement in the programme.

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DECLARATION OF GENERATIVE AI USAGE

The authors declare that Generative Artificial Intelligence (AI) tools were used solely to assist in language refinement, grammar checking, paraphrasing, and improving the clarity of the manuscript during the writing process. The authors reviewed and edited the final output as needed. All research design, data collection, analysis, interpretation of findings, and final academic decisions were carried out entirely by the authors. The authors take full responsibility for the originality, accuracy, and integrity of the content presented in this paper and the published article.

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