

Programme outcomes attainment measurement method for Bachelor of Electrical Engineering

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ABSTRACT – This study proposed the evaluation of program outcomes (PO) attainment for the Bachelor of Electrical Engineering curricular structure in Fakulti Kejuruteraan Elektrik (FKE), Universiti Teknikal Malaysia Melaka (UTeM). PO attainment measurement method based on various combination courses of the PO mapping is proposed. A preliminary framework of PO attainment based on the different input of PO attainment is also presented. Finally, this paper summarizes the proposed PO attainment measurement method that able to present the outcomes of PO attainment in FKE, UTeM.

1. INTRODUCTION

Preparing electrical engineering graduates to fulfill the Engineering Accreditation Council (EAC) and the Malaysian Qualifications Agency (MQA) requirement brought a challenge to the academic community in Malaysia. In EAC Manual, Programme Outcomes (PO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation [1]. These relate to the knowledge, skills, and attitude that students acquire through the programme. Students for Electrical Engineering Bachelor Programme in Fakulti Kejuruteraan Elektrik (FKE) are expected to attain the practice-oriented learning environment such as to design solutions and conduct the investigation for complex electrical engineering problems [2]. FKE strive hard to produce a competent, capable knowledgeable and ethical human capital that can assist the nation. These specific goals have been captured in the programme educational objectives (PEO) for Electrical Engineering Bachelor Programme. To achieve this, FKE decided to implement an Outcome Based Education (OBE) curriculum [2,3] as shown in Figure 1. Student achievement in OBE is measured by their acquired abilities to ensure the attainment of the PO.

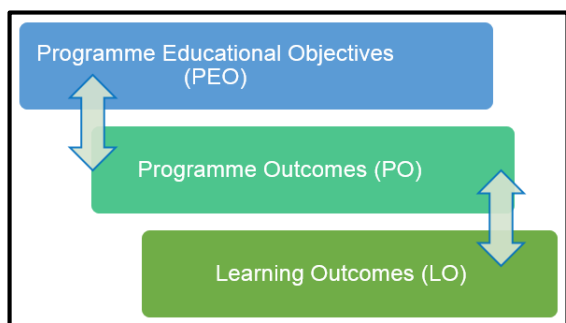


Figure 1 Overview of OBE implementation in FKE

Recently, [4,5] discuss methods to perform PO

attainment for the various case study. However, no study investigates the PO attainment evaluation for Electrical Engineering Programme. Thus, this paper proposed a PO attainment measurement method in FKE based on the 12 PO as stated in [2,3]. A preliminary framework of PO attainment for the Bachelor Electrical programme based on the different input of PO attainment is also presented. The findings in this paper provide a promising step for evaluating the performance of the PO for FKE and later to perform continuous Quality Improvement (CQI). CQI is very important in OBE to enhance the quality of the degree programme.

2. PO ATTAINMENT MEASUREMENT METHOD

The indicator of each PO attainment for the cohort in FKE is defined by more than 60% of the students get above 50% of allocation marks in the assessment [6]. Therefore, the proposed technique for the PO attainment evaluation is given by the following method:

2.1 Average Method

Let j , $j \in \{1, 2, \dots, 12\}$ represents number of PO and t define the cohort of the FKE students. Let N_j is the total number of courses mapping to the PO_j^t and $p_{k,j}$ is a percentage of course k for each PO attainment, $k \in \{1, 2, \dots, N_j\}$. PO_j^t attainment can be evaluated by

$$PO_j^t = \frac{\sum_{k=1}^{N_j} p_{k,j}}{N_j} \quad (1)$$

2.2 Weighted Average Method

Let w_k and c_k represents a weightage component of PO_j^t and a credit hour for course k . PO_j^t attainment can be evaluated by

$$PO_j^t = \frac{\sum_{k=1}^{N_j} w_k c_k p_{k,j}}{\sum_{k=1}^{N_j} w_k c_k} \quad (2)$$

Based on these two methods, the Weighted Average Method is more accurate because it considers the number of credits and percentage of assessment for each course related to the PO. Note that the total number of courses in FKE consist of Core Program (P), Elective (E) and University compulsory (W) courses.

3. DESCRIPTION OF CASE STUDY

This study aims to evaluate the PO attainment. The evaluation is done by using different input PO attainment based on method (1) and (2). The brief explanation of each model is given below. Meanwhile, Table 1

summarized the course code for PO attainment.

Model 1 (M1):

Input: PO attainment value for 54 courses with 136 total credit hours.

This model is holistic as it considers all courses in the computation.

Model 2 (M2):

Input: PO attainment value for 41 courses with 106 total credit hours.

This model is only considering all core program (P) courses.

Model 3 (M3):

Input: PO attainment value for 40 courses with 104 total credit hours.

By considering all courses that is own by FKE, this model is the simplified version of M2 and M1.

Table 1 Comparison of courses and credit hour for various model

Categories	Course Code	No of courses			Credit Hour		
		M1	M2	M3	M1	M2	M3
E	BEKX	4	0	4	12	0	12
P	BEKX	29	29	29	75	75	75
	BEKA	5	5	5	12	12	12
	BENG	2	2	2	5	5	5
	BMCG	2	2	0	5	5	0
	BMFG	2	2	0	6	6	0
	BITG	1	1	0	3	3	0
	BTMW	1	0	0	2	0	0
W	PBPI	6	0	0	14	0	0
	KOKU	2	0	0	2	0	0
Total		54	41	40	136	106	104

4. RESULTS AND DISCUSSIONS

This study investigate the performance of PO attainment evaluation of students for the Electrical Programme in FKE as the data set. Let M_i is the total number of courses k in each model i such that $i \in \{1,2,3\}$ and $k \in \{1,2,\dots,M_i\}$. The summation of the number of courses mapping to the PO_j^t attainment involves in model i , $s_{i,j}$ can be evaluated by

$$\sum_{j=1}^{12} \sum_{i=1}^{N_i} s_{i,j} \quad (3)$$

Table 2 shows the data set of PO attainment from cohort 2015/2016 FKE students. For a fair comparison, only selected courses from the core program are chosen. Figure 2 illustrates the PO attainment for the various proposed method. From the observation, the precise method to capture the performance of PO attainment in FKE, UTeM is the weighted average method based on M3. Note that the list of course in M3 fulfil a minimum of 90 credit hours of the engineering courses [1].

Table 2 Sample of PO attainment for Cohort 2015/2016 FKE students

Code	Course	PO1	PO2
BEKU 4861	ENGINEERING SEMINAR		
BEKU 4792	FINAL YEAR PROJECT I		97.18
BEKE 4753	ELECTRICAL DRIVES		
BEKP 4773	POWER SYSTEM ANALYSIS		78.26
BEKB 4761	ELECTRICAL ENGINEERING LABORATORY IV		
BEKU 2333	ELECTRIC CIRCUIT II	83.18	86.29

PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	87.32		82.02	88.2	92.70			
52.12	55.15		74.55			94.37		97.18
	31.06						92.12	92.12
							100	95.03
	100	43.45				97.62	100	

5. CONCLUSION

This study proposed the PO attainment measurement method with different input model. This can be achieved by using the weighted average method based on M3. The extended works of the authors will include extensive computation for the PO attainment evaluation of the curricular structure in FKE, based on this proposed method.

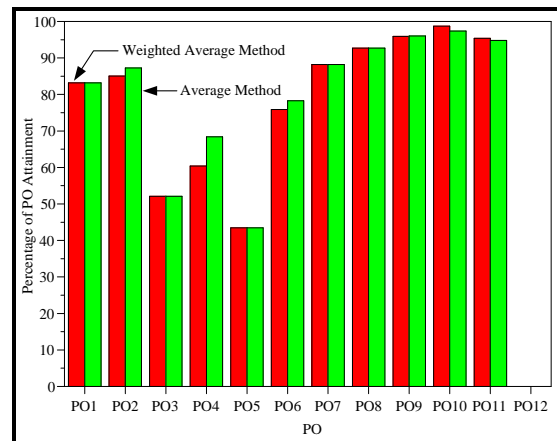


Figure 2 PO attainment for various method.

6. ACKNOWLEDGEMENT

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