Outcome Based Education Performance Evaluation on Final Year Degree Project

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Abstract: - Nowadays, implementing Outcome Based Education (OBE) to evaluate course outcomes (CO) and program outcomes (PO) is a standard practice at the Faculty of Electrical Engineering (FEE), Universiti Teknologi MARA (UiTM). This includes the evaluation of the final year degree project (FYP) since FYP is a major component of the undergraduate degree course in Electrical Engineering. The evaluation of FYP mainly consists of two stages. The first stage involves the evaluation of the technical paper and project presentation by a Technical Paper Assessment Panel (TPAP). The second stage involves the evaluation of thesis and work progress by the respective Project Supervisor (PS). These procedures are inconsistence in nature as each stage involves many lecturers from different background of disciplines in the FEE. Furthermore, there were no specific guidelines for the grading process and lecturers would rely on their experiences, resulting large variance between the seniors and juniors judgments in giving the marks. To overcome such problem, a powerful OBE evaluation tool known as Project Sensor Performance Evaluation Course Tool (PRO-SPECT) has been designed for evaluating the FYP. The output plots produced by this tool would be used as indicators for Continual Quality Improvement (CQI) recommendations. This paper presents the process of how students are being assessed when taking the FYP module by using the PRO-SPECT tool.

Key-Words: - Outcome based education; final year degree project; continuos quality improvement

1 Introduction

Outcome Based Education (OBE) is an education system that emphasis on outcomes measurement rather than inputs of curriculum covered. Outcomes may include a range of knowledge, skills and attitudes. In order to obtain the desired outcomes, teaching components and activities should be well organized, planned and continuously improved [1, 2]. OBE concept has been applied in many countries ranging from primary schools to universities. In Malaysia, the Engineering Accreditation Council (EAC) of Malaysia has directed that all engineering programs must adopt and implement OBE concept beginning 2007 [3]. In fact, it has become a major requirement for any degree program to be accredited by EAC. Faculty of Electrical Engineering (FEE) at the Universiti Teknologi MARA (UiTM) has introduced OBE knowledge amongst its staff since 2005. Beginning 2007, all degree courses have OBE elements printed in each of its syllabus. Another words, every course has their course outcomes (CO) being mapped with the FEE targeted program outcomes (PO) [4].

This mapping is known as CO-PO matrix. There are eleven Program Outcomes (PO) decided by the FEE as outlined in Table 1.

Table 1: Program Outcomes For Faculty of Electrical Engineering, Universiti Teknologi MARA

Program Outcome	Attributes
PO1	Ability to acquire and apply science and engineering fundamentals.
PO2	Ability to express ideas effectively, in written and oral form.
PO3	Acquiring in-depth technical knowledge in one or more specializations.
PO4	Ability to identify, formulate and solve engineering problems.
PO5	Ability to utilize systems approach to design and evaluate operational performance.
PO6	Ability to use the techniques, skills, and modern engineering tools necessary for engineering practices.
PO7	Ability to recognize and appreciate importance of ethical standards in professional work.
PO8	Ability to acquire lifelong learning .
PO9	Ability to apply managerial or entrepreneurship skills.
PO10	Ability to work as both an individual and in a team on electrical engineering or multi-disciplinary projects.
PO11	Knowledge of contemporary issues and appreciation of diversity in the world and intellectual areas.

Students enrolled in this program, are expected to acquire these outcomes at the end of their four year of

studies through various courses offered in the Bachelor of Engineering (Hons) Electrical Engineering program or EE220. At the FEE, the course assessment activities are divided into four components that are examinable courses, non-examinable courses, laboratory courses and final year degree project course. Each of these components has its own customized measurement tools for OBE performance as described in Table 2 below [5, 6].

Table 2: Faculty Of Electrical Engineering OBE Measurement Tools

No	Name	Code	Formative Activity	Summative Activity
1	Summative Dynamic Assessment Model with OBE Compliance	SAMOBEC	Test, Assignment, Quiz	Final Exam
2	Outcome Based Performance for Non-Exam Courses	OPNEC	Test, Assignment, Quiz, Project	Presentation, Demonstration
3	Laboratory Sensor Performance Evaluation Course Tool	LAB-SPEC	Group Related Skill, Report	None
4	Project Sensor Performance Evaluation Course Tool	PRO-SPEC	Work Progress	Technical Paper, Presentation, Thesis

2 Final Year Degree Project Module

The FYP is a core course designed for the final year degree students to acquire new knowledge and experience in project works not only related to electrical engineering but also to other related technical areas. This course has been designed to contribute to the following outcomes;

1. Solve research problem using appropriate techniques, tools, skills or algorithms (CO1).
2. Design, analyse and evaluate research works (CO2).
3. Present project findings effectively and produce technical paper and thesis (CO3).

This course is expected to provide the students with an informal training on the key elements of project management such as time management, research planning and scheduling, communication skills, problem solving and lifelong learning. Apart from that, this course will also help to prepare the students with necessary skills for pursuing a postgraduate degree in the future. This course required students to complete the project at the end of semester 8, students will demonstrate their projects to their project supervisors and there will be a question and answer session during the presentation. Students are also required to produce a technical paper based on the project. The technical paper and presentation will be evaluated by panels from members of the faculty. At the end of the 8th semester, students are required to write a technical paper in enhancing students' capability in technical writing based on their technical works. This activity would assist the students to report their work professionally according to a specific format and guidelines given by the Institute of Electrical and Electronics Engineers (IEEE). Upon the submission of technical paper, students are required to present the technical paper to the Technical Paper Assessment Panel (TPAP) as scheduled by the FYP Coordinator. The main objective of this activity is to give opportunity to the students to defense and present their work, findings and achievements of the project. Apart from that, the presentation would also assist the TPAP in clarifying any materials written in the technical paper from the students. On top of that, students will be evaluated based on their communication and presentation skills. Each student is given approximately 10-15 minutes to do their presentation followed by a 5 minutes question and answer session. Since the duration for the presentation is normally short, students are expected to organize their presentations effectively.

In FYP, students are also evaluated based on their work progress. Therefore, students are expected to meet their respective supervisors regularly to present their progress. In addition, students are required to maintain their logbooks accordingly. Only students with satisfactory progress are allowed to submit their technical papers and thesis. Students also are required to present their complete project work in the form of well-structured report (thesis). The motive is to enhance students' writing skill and it is popularly considered as the ultimate task in an undergraduate degree program. Both work progress and project report will be evaluated by the project supervisor. As a summarization, the evaluation of FYP consists of four major sections as depicted in Table 3 below.

Table 3: Evaluation for FYP

No	Sections	Marks	Evaluator
1.	Technical Paper Evaluation	25	TPAP
2.	Project Presentation	15	TPAP
3.	Student Progress Evaluation	40	PS
4.	Final Report Evaluation (Thesis)	20	PS

The FYP coordinator would then compile all the marks collected from the Technical Paper Assessment Panels and Project Supervisors and transformed them into grades.

3 PRO-SPEC Evaluation Tool

The OBE evaluation tool has been designed for evaluating FYP module. This measurement tool, known as Project Sensor Performance Evaluation Course Tool (PRO-SPECT) shown as in Figure 1, is an Excel based designed software. It has four evaluation sections; Technical Paper Evaluation, Presentation Evaluation, Student Progress Evaluation and Thesis Evaluation. In evaluating students fairly, lecturers are being provided by rubrics marking scheme for each topic in the sections above. All these raw marks plus information on the appropriate CO and PO will be used as the input when using the PRO-SPECT tool. The COs and POs addressed by the four sections above are tabulated in Table 4. It can be observed that, there is a direct or one-to-one mapping between each CO and its respective PO. The system tool finally will produce performance plots that show students' POs achievement scores. In addition, lecturers can also analyse other plots such as COs and POs density, as well as students' population density in achieving the scores. All these plots can be used by the lecturer to prepare a Continual Quality Improvement (CQI) report for the laboratory module.

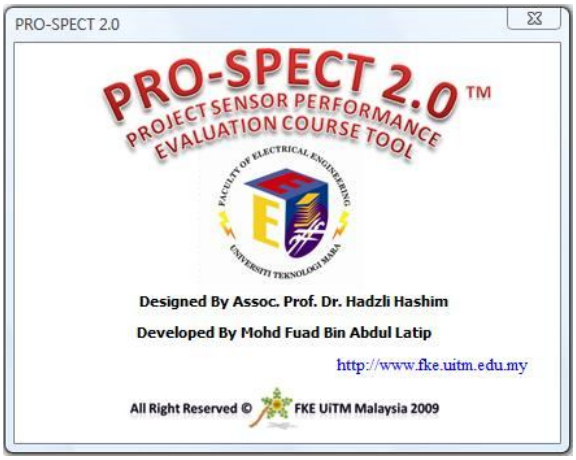


Fig. 1: PRO-SPECT Introductory Page

Table 4: COs and POs Specifications for FYP

Sections	CO	CO Attributes	Addressing PO
TECHNICAL PAPER EVALUATION	CO3	Abstract: Objective(s), Scope of Study, Methodology & Findings	PO2
	CO3	Introduction: Overview of Study, Problem Statement, Problem Identification, Significance of the Study, Objective and Scope of Study	PO2
	CO3	Methodology: Algorithm, flow charts or pseudo codes of the programming codes OR/AND, hardware design, block diagram, appropriate circuitry and relevant techniques towards achieving the project outcomes	PO2
	CO3	Results and Discussion: Exhibit the significant results of the project, Discus and analyse the results of the project	PO2
	CO3	Conclusion: Students should be able to conclude the findings in addressing the objective of the project & Recommendation for future work	PO2
	CO3	Format: Written according to format	PO2
PROJECT PRESENTATION EVALUATION	CO3	Engagement: Appearance, gesture, voice & eye contact	PO2
	CO3	Presentation Skills: Suitable Tone of Voice, Fluent English usage, Effective Use of Presentation Aids, Convincing	PO2
	CO3	Content: The presentation slides should consist the followings: Introduction, Methodology/Project work, Results and Discussion, Conclusion and Recommendation	PO2
	CO2	Question and Answers: Ability to answer questions convincingly.	PO5
PROGRESS EVALUATION	CO1	Attendance: Ability to frequently meet with supervisor	PO6
	CO2	Creativity: Ability to gather information and resources for the given problem	PO5
	CO3	Work progress: Ability to use and record any work progress in a logbook for a given timeline	PO2
	CO3	Demonstration and finding of results: Ability to demonstrate and analyse results with appropriate reasonable explanation	PO2
THESIS EVALUATION	CO3	Abstract: Students should be able to briefly summarize what has been done, and also demonstrate the findings of the project	PO2
	CO3	Introduction : Background of Study, Problem Statement, Problem Identification, Significance of the study, Objective, Scope of Work & Thesis Organization	PO2
	CO3	Literature Review: Students should be able to review the references within the scope of study & Students should also be able to perform analysis on previous works	PO2
	CO2	Methodology/Project Work: Student should include the algorithm, flow charts or pseudo codes of the programming codes OR/AND; Students should include the hardware design, block diagram, appropriate circuitry and relevant techniques towards achieving the project outcomes	PO5
	CO3	Results and Discussion: Students should exhibit the significant results of the project, Students should be able to discus and analyse the results of the project	PO2
	CO3	Conclusion: Students should be able to conclude the findings in addressing the objective of the project	PO2
	CO3	References: Students should write the references in accordance to the specific format (i.e. IEEE format)	PO2
	CO3	Others: Writing Style, Grammar & Compliance to the FYP standard/guideline	PO2

The first step of using the tool is to identify the CO-PO mapping of FYP with respect to Table 4. The CO-PO mapping of the respective FYP evaluation sections will be printed in Table 5 – Table 8 automatically. Only the strongest PO is identified for each CO. These mapping enables the distribution of the CO addressed by each evaluation sections and eventually, the relationship between COs and POs that are being addressed and can then be observed.

Table 5: CO-PO Mapping for FYP (TPE Section)

		TECHNICAL PAPER EVALUATION (TPE)					
Coding		FYP 2 TPE 1 CO3	FYP 2 TPE 2 CO3	FYP 2 TPE 3 CO3	FYP 2 TPE 4 CO3	FYP 2 TPE 5 CO3	FYP 2 TPE 6 CO3
Marks		10.00	15.00	20.00	30.00	20.00	5.00
Course Outcomes		CO3	CO3	CO3	CO3	CO3	CO3
Programme Outcomes (Please Refer Course CO-PO Matrix) The strongest PO will be selected AUTOMATICALLY	PO1						
	PO2	√	√	√	√	√	√
	PO3						
	PO4						
	PO5						
	PO6						
	PO7						
	PO8						
	PO9						
	PO10						
	PO11						

Table 6: CO-PO Mapping for FYP (PPE Section)

		PROJECT PRESENTATION EVALUATION (PPE)							
Coding		FYP 2 PPE 1 CO3	FYP 2 PPE 2 CO3	FYP 2 PPE 3 CO3	FYP 2 PPE 4 CO3	FYP 2 PPE 5 CO3	FYP 2 PPE 6 CO3	FYP 2 PPE 7 CO2	FYP 2 PPE 8 CO3
Marks		5.00	10.0	5.00	5.00	5.00	10.0	5.00	5.00
Course Outcomes		CO3	CO3	CO3	CO3	CO3	CO3	CO2	CO3
Programme Outcomes (Please Refer Course CO-PO Matrix) The strongest PO will be selected AUTOMATICALLY	PO1								
	PO2	√	√	√	√	√	√		√
	PO3								
	PO4								
	PO5							√	
	PO6								
	PO7								
	PO8								
	PO9								
	PO10								
	PO11								

Table 7: CO-PO Mapping for FYP (PE Section)

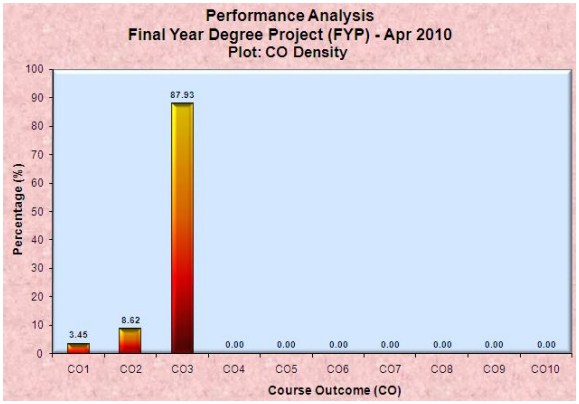
		PROGRESS EVALUATION (PE)			
Coding		FYP 2 PE 1 CO1	FYP 2 PE 2 CO2	FYP 2 PE 3 CO3	FYP 2 PE 4 CO3
Marks		10.00	5.00	10.00	15.00
Course Outcomes		CO1	CO2	CO3	CO3
Programme Outcomes (Please Refer Course CO-PO Matrix) The strongest PO will be selected AUTOMATICALLY	PO1				
	PO2			√	√
	PO3				
	PO4				
	PO5		√		
	PO6	√			
	PO7				
	PO8				
	PO9				
	PO10				
	PO11				

Table 8: CO-PO Mapping for FYP (FRE Section)

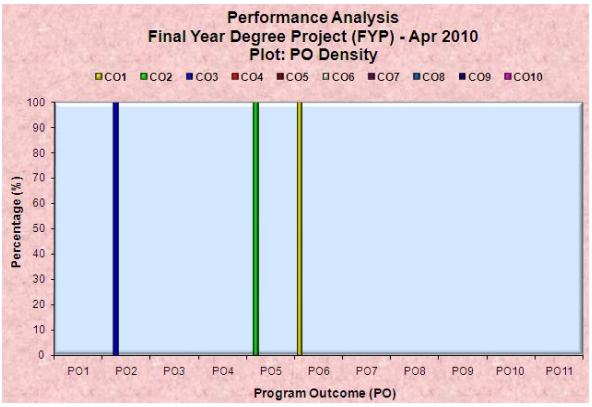
		FINAL REPORT EVALUATION (FRE)							
Coding		FYP 2 FRE 1 CO3	FYP 2 FRE 2 CO3	FYP 2 FRE 3 CO3	FYP 2 FRE 4 CO2	FYP 2 FRE 5 CO3	FYP 2 FRE 6 CO3	FYP 2 FRE 7 CO3	FYP 2 FRE 8 CO3
Marks		10.0	10.0	10.0	15.0	25.0	15.0	5.0	10.0
Course Outcomes		CO3	CO3	CO3	CO2	CO3	CO3	CO3	CO3
Programme Outcomes (Please Refer Course CO-PO Matrix) The strongest PO will be selected AUTOMATICALLY	PO1								
	PO2	√	√	√		√	√	√	√
	PO3								
	PO4								
	PO5				√				
	PO6								
	PO7								
	PO8								
	PO9								
	PO10								
	PO11								

4 Performance Analysis

Once the CO-PO mapping is done, students' marks for the evaluation sections are ready to be entered and processed for any output measurements. Next, the system tool will produce performance plots that show the CO density as well as PO density as depicted in Figure 2. As can be seen from Figure 2(a), this FYP is concerning on 3 COs with CO3 have the highest density that is 87.93%. This indicates that students are required to pay more attention to CO3 that is to present project findings effectively and to produce technical paper and thesis. The density for CO1 which is focusing on solving research problem using appropriate techniques, tools, skills or algorithms is about 3.45%. Whereas, the density for CO2 which is focusing on designing, analysing and evaluating research works is about 8.62%. All of these COs are mapped to three POs respectively as depicted in Figure 2(b). Since each CO addressing one PO, thus all the three POs have a weight of 100%.



(a) CO Density



(b) PO Density

Fig. 2: Distributions of COs and POs for FYP

Guidelines for giving the marks can be referred to the rubrics table shown in Table 9. These rubrics mapping of students' performance exercise will actually allow TPAP and PS to justify any marks given to their students. These marks will be filled in a customized evaluation form provided by the FYP coordinator at the end of the 8th semester. Since PRO-SPECT produces output measurement of POs and indirectly, the COs achievement by the students, therefore the processing engine in the tool is designed specifically for these purposes. The algorithm is being formulated to map and compute all input marks with its respective PO. The final measurement score is computed by normalizing the actual student's earned point with the total maximum possible point. Equation 1 describes the calculation of a PO score respectively. During the process of calculating a specific PO score, all other non-relevant POs and COs are disabled by labeling them as logic '0'. Alternatively, only the interested PO is labeled as logic '1'. In that case, only the respective student's mark for this PO is considered in the calculation process.

Table 9: Rubrics Evaluation Form for FYP

Components	1 (Very Weak)	2 (Weak)	1 (Moderate)	1 (Strong)	1 (Very Strong)
TECHNICAL PAPER EVALUATION	Not clearly stated	Only 1 element clearly stated	Only 2 elements clearly stated	Only 3 elements clearly stated	All elements clearly stated
	Only 1 element clearly stated	Only 2 elements clearly stated	Only 3 elements clearly stated	Only 4 elements clearly stated	All elements clearly stated
	Only 1 element fulfilled but not clearly stated	Only 1 element fulfilled and clearly stated	All elements fulfilled but not clearly stated	All elements fulfilled but 1 element not clearly stated	All elements fulfilled and clearly stated
	Results do not meet project's objective	Results are available without analysis and discussion	Results are available with wrong analysis	Results are available with correct analysis	Results are available with correct analysis and discussion
	No conclusion on the achievement of project objectives, No recommendation of future work	Only 1 element fulfilled but not clearly stated	All element fulfilled but not clearly stated	All element fulfilled but only 1 element clearly stated	All element fulfilled and clearly stated
	Wrong paper structure and wrong format	Wrong paper structure but partially wrong format	Correct paper structure with more than 2 wrong formatting elements	Correct paper structure with less than or equal to 2 formatting elements	Correct paper and Correct Format
PROJECT PRESENTATION	not dressed formally, no facial expression or eye contact	not dressed formally, satisfactory facial expression and eye contact	dressed formally, no facial expression and eye contact	dressed formally, regular facial expression and eye contact	dressed formally, consistent facial expression /eye contact
	No element is fullfilled	Only 1 element is fulfilled	Only 2 element is fulfilled	Only 3 element is fulfilled	All elements are fulfilled
	No element is fullfilled	Only 1 element is fulfilled	Only 2 element is fulfilled	Only 3 element is fulfilled	All elements are fulfilled
	No answers	Answers not related to questions	Answers related to questions with poor points	Answers related to questions with good points	Good expression of ideas, Very convincing
PROGRESS EVALUATION	Meet less than 3 times per semester	Meet more than 3 times per semester but less than 5 times	Meet more than 5 times per semester but less than 7 times	Meet more than 9 times per semester but less than 10 times	Meet more than 10 times per semester
	Too dependent and not creative	Dependent but show some creativity	Independent, show some creativity	Independent and creative	Highly independent, creative and can work with minimum supervision
	No logbook and no progress	No logbook with poor progress	Logbook maintained with poor progress	Logbook maintained with good progress	Logbook maintained with advanced progress
	No element met	Only results are demonstrated	Results demonstrated and analysed critically, but no explanation of results	Results demonstrated and analysed critically with inaccurate explanation of results	Results demonstrated and analysed critically with accurate explanation of results
THESIS EVALUATION	Not clearly stated	Only 1 element clearly stated	Only 2 elements clearly stated	Only 3 elements clearly stated	All elements clearly stated
	Only 1 element clearly stated	Only 2 elements clearly stated	Only 3 elements clearly stated	Only 4 elements clearly stated	All elements clearly stated
	Literature review irrelevant to study	Explain previous studies, but no discussions on pros and cons	Explain previous studies, with insufficient discussions on pros and cons	Explain previous studies, with good discussions on pros and cons. No explanation of the need of study at	Explain previous studies related with good discussions on pros and cons, and finally explain the need of the

				the end	study
	No relevant flowchart or block diagram and there is no procedures or techniques or experimental setup	No relevant flowchart or block diagram. The procedures or techniques or experimental setup are not in sequence, illogical, incomplete and unclear	There is relevant flowchart or block diagram and the procedures or techniques or experimental setup are partially in sequence, logical, complete and partially clear	There is relevant flowchart or block diagram and the procedures or techniques or experimental setup are in sequence, logical, complete and partially clear	There is relevant flowchart or block diagram and procedures or techniques or experimental setup are in sequence, logical, complete and very clear
	Results do not meet project's objective	Results are available without analysis and discussion	Results are available with wrong analysis	Results are available with correct analysis	Results are available with correct analysis and discussion
	No conclusion on the achievement of project objectives, No recommendation of future work	Only 1 element fulfilled but not clearly stated	All element fulfilled but not clearly stated	All element fulfilled but only 1 element clearly stated	All element fulfilled and clearly stated
	All references are in incorrect format	More than 5 references are in incorrect format	More than 3 references and less than or equal to 5 references are in incorrect format	More than 1 references and less than or equal to 3 references are in incorrect format	All references are in correct format
	Very frequently used wrong choice of words with more than 30 grammatical errors. Wrong citations observed and does not follow the FYP guidelines at all	Very seldom used wrong choice of words with more than 20 grammatical error but less than or equal to 30 grammatical error. Wrong citations observed and does not follow the FYP guidelines at all	Correctly used choice of words with more than 10 grammatical error but less than or equal to 20 grammatical errors. Correct citations observed and follow the FYP guidelines	Correctly used choice of words and exists good transitions between statements. Has more than 5 grammatical errors but less than or equal to 10 grammatical errors. Correct citations observed and follow the FYP guidelines	Good variation in using choice of words with good transitions and coherence between statements. Has less than 5 grammatical error with proper citations and compliance to FYP guidelines

$$\%PO_{i=1,2,3....}^{student} = \frac{\begin{bmatrix} SM^{C_1} \\ SM^{C_2} \\ - \\ - \\ SM^{C_j} \end{bmatrix}^T \cdot \begin{bmatrix} PQ_i^{C_1} \\ PQ_i^{C_2} \\ - \\ - \\ PQ_i^{C_j} \end{bmatrix}}{\begin{bmatrix} RM^{C_1} \\ RM^{C_2} \\ - \\ - \\ RM^{C_j} \end{bmatrix}^T \cdot \begin{bmatrix} PQ_i^{C_1} \\ PQ_i^{C_2} \\ - \\ - \\ PQ_i^{C_j} \end{bmatrix}} x100 = \frac{\sum_{j=1}^{totalcomponent} \left(SM^{C_j} \, x \, PQ_i^{C_j} \right)}{\sum_{j=1}^{totalcomponent} \left(RM^{C_j} \, x \, PQ_i^{C_j} \right)} = x100 \quad (1)$$

Where;

SM	=	student's marks
RM	=	total marks
PO	=	program outcome (logic '1' or '0')
C	=	assessment component

Raw marks from the evaluation form submitted by the TPAPs and PSs are compiled and data entry will be done by the FYP coordinator. Once the students' marks are entered, measurement of their POs score will be automatically produced. Simultaneously, an average score for the respective POs will be computed which represent the overall performance of the students taking this FYP. All of these scores are displayed in terms of plot and thus, conclusion can be derived from them. An example of this plot is shown in Figure 3 below.

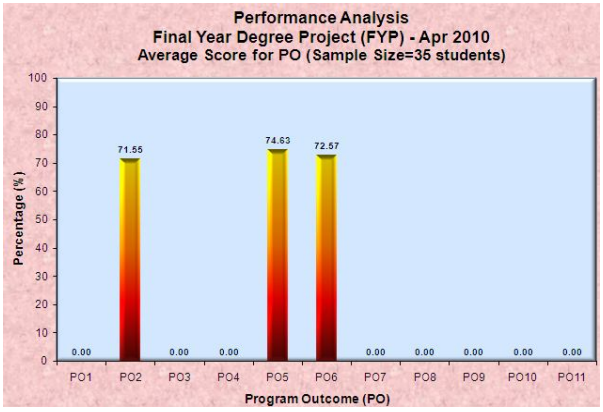


Fig. 3: Distributions of PO Average Score for FYP

As illustrated in Figure 3, it can be seen that all POs can be considered as strongly being achieved where the score are more than 70%. PO5 which is related to the system approach has the highest score, indicating the students managed to utilize systems approach to design and evaluate operational performance. PO2 which is focusing on expressing ideas effectively in written and oral form has the lowest PO score that is around 71.55%. This is due to some of the students did not perform well during the project presentation and poor thesis writing. The next phase involves transforming the PO scores into a qualitative ranking

level by using the guide line table given by the FEE. Table 10 refers also as the Key Performance Index (KPI) to be achieved where a score of more than 65% will be defined as very strong. Actually, this discretion table is originated from the applied conventional grade point average system where anything less than 50% is considered to be non-performing or below grade 'C', and a score more or equal than 65% reflects a grade 'B' [7]. Sustaining a strong ranking or 'B' for every course will eventually result in the students to at least graduate with an upper second class honors. Besides that, performance of the students in FYP can always be easily monitored, tracked or compared regularly between one group to another.

Table 10: Key Performance Index Ranking

PO Score (%)	Rank Level	Description	Color Code
0-49	1	Weak	Red
50-64	2	Moderate	Yellow
65-100	3	Strong	Green

Figure 4 represents the PO average score in terms of ranking level of achievement. As shown in the previous figure, the three POs addressed by this course had achieved score more than 70% which is very strong (level 3). Therefore, this batch of students has shown strong attributes in the identified POs. PRO-SPECT can also provide avenue for the lecturer to dissect his/her students' density performance so that future improvement can be made during delivery in the FYP. Such indicator is described in Figure 5, where it can be observed that almost 77% of students have strongly achieved PO2 and PO5 whereby only 54% of students have achieved PO6 which is related to the ability to use the techniques, skills and modern engineering tools for engineering practices. About 14% of students are found to be weak in PO6 and about 3% are weak in PO5.

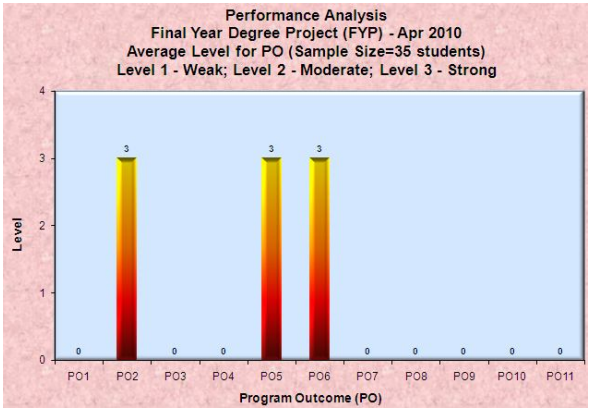


Fig. 4: Distributions of PO Average Ranking for FYP

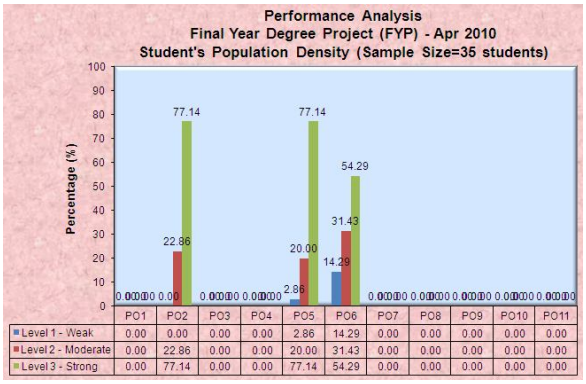


Fig. 5: FYP Students' Density for Different Ranking Level

5 Continuous Quality improvement

As this course is considered as a major component of the undergraduate degree course in Electrical Engineering, students are expected to be familiar with all the important elements to be practiced when doing the FYP. From all the plots observed, at this stage it can be considered that all POs that are addressed by this course had achieved the target. However, there is still room for improvement especially to increase the students' performance for PO6 score. The recommendation for improvement includes the followings:

1. Increase the understanding of the concept of engineering technique and skill in solving the problems so that students can apply the knowledge in solving their FYP problems.
2. Encourage and motivate students to use/explore modern engineering tools in their FYP.

6 Conclusion

The process of evaluating the outcomes of Final Year Degree Project (FYP) module in FEE, UiTM used to be very complicated as the FYP module consists of four evaluation sections. Thus, a user friendly and reliable supporting tool known as PRO-SPECT has been developed to facilitate the lecturers/FYP coordinators to do the evaluations. The system offers a systematic ways in evaluating FYP performance that consists of Technical Paper Evaluation, Project Presentation Evaluation, Student Progress Evaluation and Final Report (Thesis) Evaluation. The system will use raw marks gained by students and compute their measurement score of the respective POs. The system outputs are in the form of various plots that can provide indicators to the lecturers/FYP coordinators for recommending further improvement. This paper has described the step by step algorithm used by the PRO-SPECT to evaluate FYP in FEE, UiTM. Students' raw marks from the assessments activities during the December 2009-April 2010 semester session were used as inputs for the system. Outputs plots of average score and ranking of achieved POs as well as the students' density for the three different ranking levels are shown. These plots can be used and analysed thoroughly by the respective lecturer/ FYP coordinator and later make recommendations to be implemented for Continuous Quality Improvement (CQI) exercise.

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