

Profiling the Performance of Electrical Engineering Bachelor Degree Students Based on Different Entry Levels

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Abstract: - In Malaysia, students will qualify to enroll into a Malaysian public university via three ways, that is, through three different entry requirement levels. The objective of this study is to investigate the performance of students of Universiti Teknologi MARA's (UiTM) Bachelor of Electrical Engineering Degree program based on the student's entry levels. We initiated a study of the longitudinal progress based on two consecutive intakes of matriculation students in July 2005 and July 2006. We applied the same methodology to two other consecutive intakes of Diploma July 2006 and July 2007 students' intakes. As a measure of the students' performance, we used the Cumulative Grade Point Average (CGPA) as the key performance index. In addition, this paper includes an overview of the Malaysian educational system.

The outcomes of the research indicate that there is a relationship between the entry level and the final academic performance. Thus it can be concluded that the entry level requirement is an important factor in influencing the student's academic performance.

Keywords: Academic Performance, Ability, Entry Levels, CGPA

I. INTRODUCTION

1.1 Malaysian System of Education

MALAYSIA is one of the countries in South East Asia that has a well-established education system. Malaysian national schools share the same education system. After attending pre-school usually between the ages of 4 to 6, students attend years 1 to 6 from the ages of 7 to 12 at the primary education level. Then, they continue to secondary school and subsequently, to tertiary education; undertake semi-skilled courses or starts work. On average a student spends a total of thirteen years (13) in pre-school, primary and secondary schools. After secondary education, students who did well in the examination could continue to a two year sixth form in the secondary schools then subsequently undertake a centralized examination (The Malaysian Higher School Certificate (HSC) or "Sijil Tinggi Pelajaran Malaysia (STPM)") which if they do well, will enable them to apply to certain courses at the degree level in Malaysian public universities. [1], [2], [3], [4]

Other alternative routes that enable students to apply to engineering degree level courses are via the more popular

route which is to undertake pre-university programs or matriculation programs. Another longer route which is popular with students that did not do very well in the examinations after the secondary level education is to first obtain a diploma in a relevant engineering course and subsequently apply to continue to a degree level course upon completion of the diploma studies.

The advantage of first doing a diploma is that the students could decide to first gain some work experience before continuing their studies to a degree level. Engineering diploma holders can work as assistant engineers in the public or private sector or they can immediately further their studies in institutes of higher learning (IHLs).

Universiti Teknologi MARA (UiTM) is one of the public institutions of higher learning in Malaysia that offers Bachelor of Engineering Degree courses. UiTM has the philosophy that every individual has the ability to attain excellence through the transfer of knowledge and assimilation of moral values so as to become professional graduates capable of developing knowledge, self, society and nation [5][6]. In general, for the Electrical Engineering Degree program, UiTM's entry qualification is via a matriculation program and for those who have a diploma level certification [7]. Fig. 1.0 shows the overall system and structure of education in Malaysia.

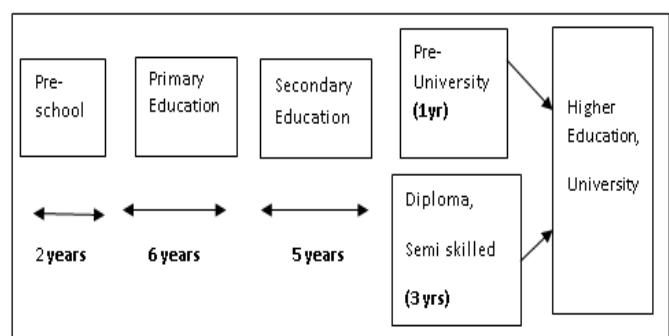


Fig 1.0: Malaysian education structure

One of the objectives of the Ministry of Education of Malaysia is to prepare and increase the nation's human resource for development needs [8]. Thus, alternative routes

are made available for students to continue their education after secondary schooling. Various off campus and part-time engineering degree and diploma level programs are also available for students who wish to study in an engineering course. [9]

1.2 Bachelor of Electrical Engineering Degree Program in UiTM.

The Bachelor of Engineering (Honours) Electrical Programme evolved from the Advanced Diploma Programme which started in 1968. It became a two-tier Programme in 1976 with the introduction of the Diploma Programme. Under the two-tier system, the students undergo three (3) years of Diploma Programme after Sijil Pelajaran Malaysia (SPM) followed by two and a half (2½) years of Advanced Diploma Programme. The Advanced Diploma Programme was renamed as Bachelor of Engineering (Honours) Electrical in 1996 with the amendment of the ITM Act.

In the year 2000 and in accordance with the directive from the Ministry of Education, the Programme was transformed to a four (4) year degree Programme with intake from Matriculation and Sijil Tinggi Pelajaran Malaysia (STPM) or equivalent.

It is a four year program or eight semesters for intakes from Matriculation. It is a broad based program whereby students will be introduced with basic Fundamentals of Engineering Mathematics, Electrical Engineering Circuits and Fundamentals of Electronics at semester one. Then students will be introduced to subjects such as Signals and System, Basics Communication, Computer Programming and Electrical Machinery. They will choose specialization only in the third year. The different fields of specialization include Power, System, Computer, Electronics and Communications. Students will be equipped with Entrepreneurship and Management skills as well as an introduction to the role of engineers in society in the final year. In addition, students must undertake a final year project based on their specialisation. [10]

The curriculum is arranged such that students will take up an average of 15 to 18 credit hours per semester. In order to graduate, students must undertake a total of 137 credits with a minimum CGPA score of 2.00 [10]

However, students from the Diploma level intake can graduate within six semesters or three years, as they will be given credit exemption for subjects in semesters 1 and 2. Students are allowed to extend an additional two semesters to complete their Bachelor Degree program. Beyond that, students will have to pay an additional cost according to the number of credit hours taken.

This degree program hopes to produce graduates with academic qualifications, soft skills and good personal qualities, which are traits desired by employers [11].

1.3 Research Background

There are many factors that contribute to the overall performance of students which include curriculum, teachers and the students themselves. This paper present the outcomes of an investigation that compares the performance of students based on their different entry levels. The measure of academic performance is based on the student's CGPA. The CGPA score is one of the criteria used by many employers as a basis to invite graduates for the first round of interview in addition to other required criteria/traits like leadership, effective communication skill, interpersonal and entrepreneurial skill [11].

II. RELATED WORKS

N Ali et al [12] found that demography, active learning, student's attendance and involvement in extracurricular activities are positively related to student's performance. In addition, they found that students with parents who are highly educated and have high income secured greater CGPA. They also concluded that attendance and active participation of students during learning process also contributed to the high CGPA. However the study did not compare the different entry levels of students to a degree program.

H Haron et al [13] showed some of the factors that affect students' performance in their department which include syllabus, lecturers and students themselves. He even discussed teaching approach of Statics and learning difficulties among students in his department. They concluded that Mathematics and prior knowledge in Physics are important to grasp the concepts in Engineering Statics. This implied that the entry requirements based on Mathematics and Physics must be considered be it at Matriculation or Diploma intakes. Electrical Engineering courses are mostly based on Mathematics and Physics whereby students must have the ability to apply them in solving Electrical Engineering problems.

N Rajab et al [14] showed that students learn in many ways through their different perception, attitude, responses to specific classroom environment and instructional practices. At the start of a degree program, our observation showed that Matriculation students are very excited as campus life is new to them while those from Diploma tend to be more relaxed due to the fact that they are more familiar with a University system and environment. Those from Matriculation have different attitudes and perception than those from Diploma.

The literature review indicates that there are many factors that will affect a student's academic performance. Other than the student's academic ability, other factors that can affect students' grades are for example, environment, teaching methodology, teaching aid, students' attitude and lecturers' involvement during teaching.

All off the above factors will affect the overall performance of students. Our observation showed that students that are able to strategize adopt and adapt to the University life as quickly as possible will in most cases maintain the CGPA from the first semester until they graduate. The above average students (strong ability) with strong credits in Mathematics and Physics can manage well and become high achievers. While the mediocre students just finish with average CGPA and others need additional semesters to graduate. The academic advisors can also play a role in helping students achieve high grades. When they detect low results that will produce alarming CGPA value, the academic advisors can play their roles as early as possible so as to help students to manage their studies, improve study skills, avoid procrastination, and nurture self-confidence and to acquire positive thinking. [15]

III. METHODOLOGY

The methodology used in the study is the longitudinal progress of students from different batches. CGPA was the only parameters measured as far as academic performance of students are concerned. The sample of students was from various Matriculation centres in Malaysia namely Kedah, Melaka, Labuan, Perak, Seremban, Pulau Pinang, Negeri Sembilan, Pahang, Kelantan and Johor.

The first sample of the study was taken from first batch of students from Matriculation intake in July 2005. We noted the last CGPA of the students from matriculation as entry point to university. We also keep track of their CGPA results for every semester until graduation. Then we took the second sample of students from matriculation intake July 2006. We track their performance using the same longitudinal progress based on CGPA.

We focused on the following factors:

- ability of students at entry point
- performance of students at first semester
- CGPA follow through
- final CGPA correlation with the first semester
- Factors that influence the academic performance.

IV. FINDINGS

We found the following observations:

A. Matriculation students

Ninety three (93) students who entered semester 1 consisted of 35 female and 58 male students for Matriculation intake July 2005. Two overseas students were; one (1) female from Mauritius and one (1) male student from Yemen.

Fig. 2.0 shows overall students CGPA for all the eight semesters for the first sample batch of students. From this batch of students, first semester result showed that five (5) students were dismissed with CGPA less than 1.6 based on Academic Regulation. [10]

It is also shown that eighty one (81) students managed to reach semester 8 and sixty nine (69) or (85.19%) graduated on time while twelve (12) students or (14.8%) extended to graduate. From sixty nine graduated, seven (7) or (8.64%) obtained First class, fifty two (52) or (62.6 %) secured Second upper and eleven (11) or (13.56%) obtained second lower.

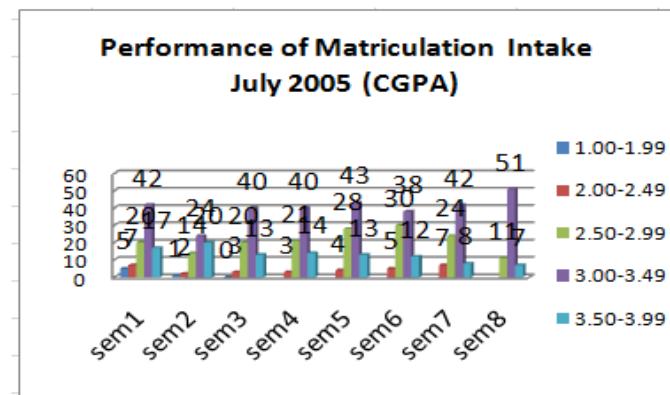


Fig. 2.0

We consider matriculation students at the entry level with a CGPA between 3.5- 4.0 to have strong ability, CGPA of 3.0- 3.49 to be of medium ability and those with CGPA of lower than 2.99 of poor ability. In general only those with a CGPA of 3.0 and above are accepted into the Degree program.

A sample of strong ability students were identified and tracked based on CGPA levels throughout their studies at the university. Fig. 2.0 shows that strong ability students maintained their performance all the way through until graduation.

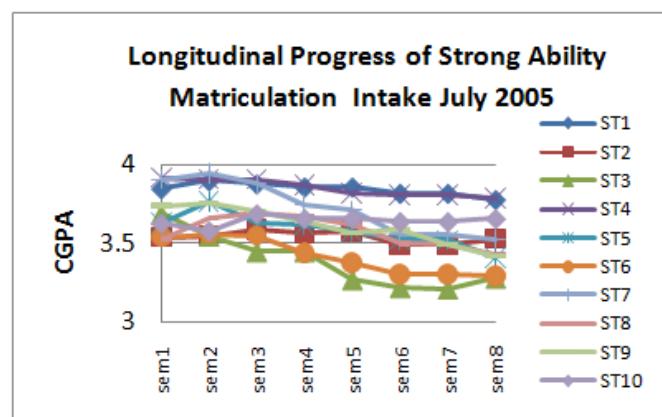


Fig 3.0

On the other hand, those students with medium ability were unable to complete the entire program within the specified time. A sample of those who extended the Program in order to graduate was analysed. These students had medium ability in their foundation right from semester 1. Their performance showed that they needed a longer track and slowly but steadily process towards graduating. In fact some strategized to take

up longer time so as to maintain steady CGPA. Fig. 4.0 shows the longitudinal progress of such students. They did manage to graduate finally with a reasonable CGPA value.

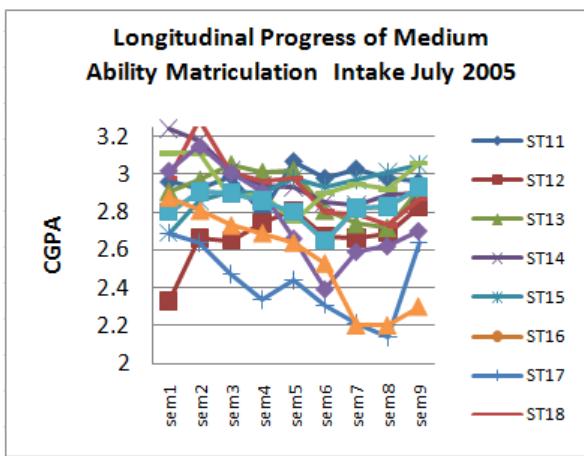


Fig. 4.0

This type of students needed guidance from their advisors and must be equipped with strong confidence level and determination to finish to the end of Program.

The same longitudinal progress was applied to another sample of matriculation students, batch intake July 2006. There were one hundred seventy four (174) students entering the system in Semester 1. After one semester, nine (9) students were dismissed based on Academic Regulation. However, one hundred and forty three students (143) managed to reach semester 8. One hundred (100) managed to graduate on time while thirty nine (39) needed further time to graduate. Another four (4) were dismissed due to failure three times in any course registered.

From total graduates, sixteen or (16 %) secured First Class, fifty eight or (58 %) Second Class Upper and twenty five or (25%) managed Second Class lower.

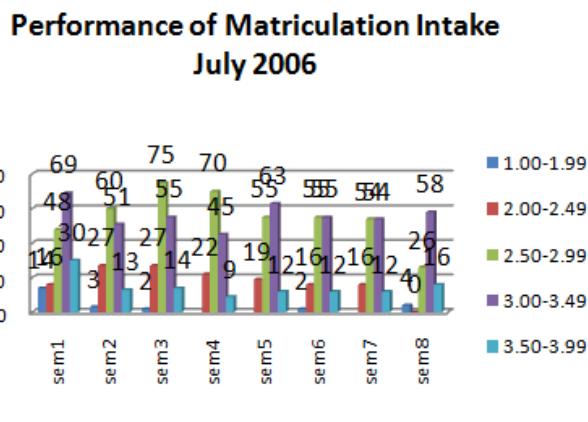


Fig. 5.0

Fig. 5.0 shows that fifty per cent (50%) of students managed to obtain CGPA of 3.00 at first semester and the percentage reduces as it goes with the semester.

Then a sample of strong ability students was followed through from semester 1 till graduation as shown in Fig. 6.0

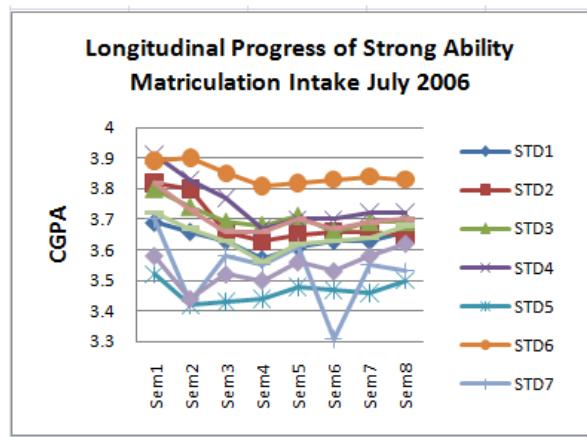


Fig. 6.0

These students were again very stable in their CGPA right from semester 1 even though their performance varied. On the other hand, many of the medium ability students did not make it within the time allocated. They required extension of at least one more semester to graduate. Fig. 7.0 shows their progress.

From these findings, it can be seen that students with strong ability in Mathematics and Physics at entry level were very stable and managed to complete the degree program within the specified time. The medium ability students required guidance, motivation, advices and effective study skill in order to graduate with a reasonable CGPA value. They needed extra time to finish the total credit hours required. Their performance tends to vary from one semester to another semester based on the difficulties of the courses registered during the session.

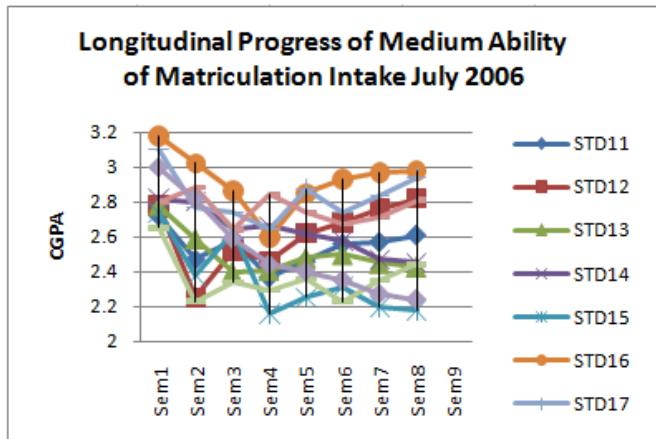


Fig. 7.0

B. Diploma students

The same approach was applied to a group of Ex-Diploma students, batch intake of July 2006. This batch of students in general should graduate within six (6) semesters. However, the ability of the students will determine whether they can graduate within specified time with a reasonable CGPA value. Fig. 8.0 shows the overall performance of these students.

There were one hundred and eighty three (183) diploma students entering into semester 3 of the Degree Program. After one semester, seven (7) were dismissed based on Academic Regulation. One hundred and seventy four (174) students managed to reach semester 8 and one hundred and thirty nine (139) or (79 %) graduated on time while thirty five (35) or 20% extended.

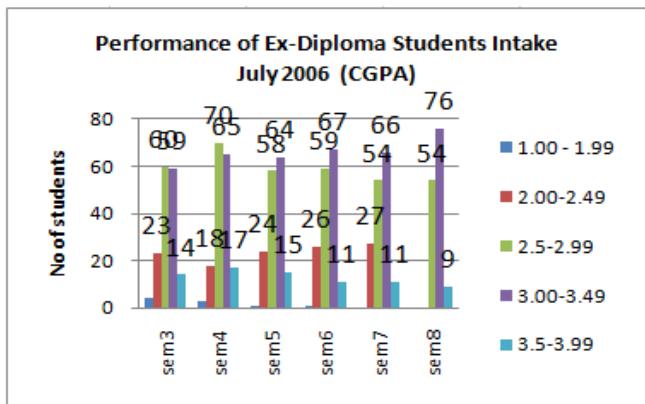


Fig 8.0

Then a sample of strong ability students was studied based on the longitudinal progress from early semester until graduation. Similar to the matriculation sample, diploma students with strong abilities maintained their performance throughout their university life as seen in Fig. 9.0.

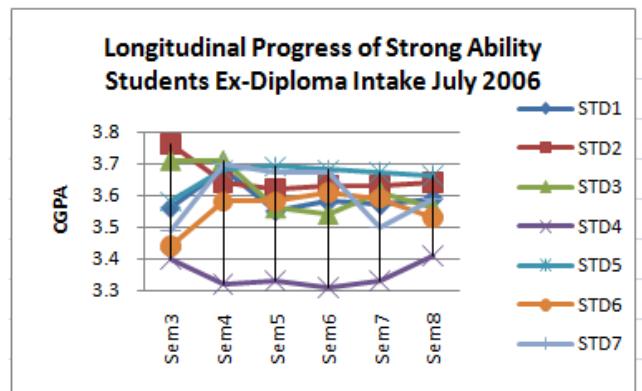


Fig 9.0

The performance of CGPA varied but it is within acceptable and stable values. They managed to show stability in CGPA

from semester 3 till semester 8. On the other hand those with medium ability were not able to perform well and their CGPA showed slow progress and very unstable at times. Fig. 10.0 shows such progress.

Those with medium ability from ex-Diploma managed to graduate slowly with reasonable CGPA even though they needed extra time to pull through.

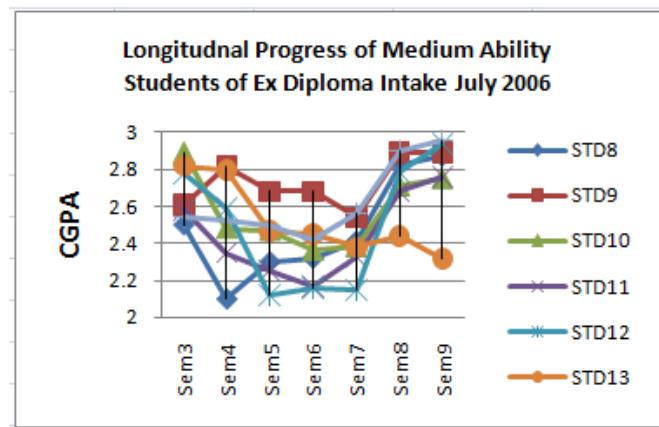


Fig 10.0

Then the same approach was applied to a group of batch Ex Diploma for July 2007. There were two hundred and fifty two (252) students registered into semester three and only two hundred and fourteen (214) managed to reach semester 8. Out of that figure only one hundred and sixty (160) or (74.7%) managed to graduate on time and fifty four (54) or (25.2%) students extended to graduate.

Samples of strong ability students and medium ability students were followed through based on the longitudinal progress from semester three till semester eight. Fig. 11 and 12 show such progress. As depicted, the trends are similar to that of Figures 9 and 10. That is both diploma level batch intakes shows similar results/trends throughout their degree program.

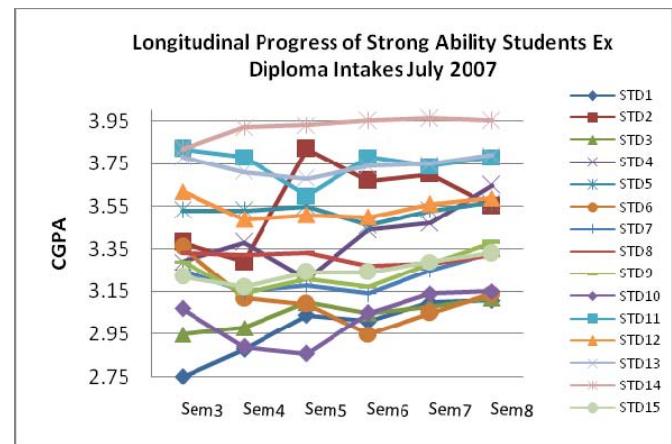


Fig 11.0

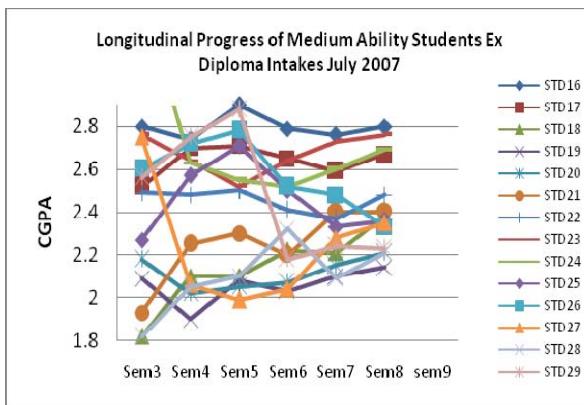


Fig 12.0

C. Comparison between Matriculation and Diploma intake students in the same academic program

The students academic performance were compared between two batches of intakes from Matriculation level and that of two batches of students with diplomas entering straight into the 3rd semester of the same program as shown in Figure 13.

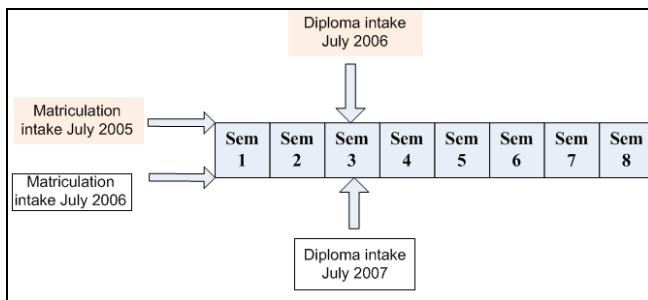


Fig. 13.0

As shown above, the matriculation intake level of July 2005 will undergo the same program and graduate in April 2009 together with the diploma holders of the July 2006 intake which is directly into the third semester. From Figures 14 and 15, we noted that for the Matriculation July 2005 batch, 10% secured First Class Honours, 74% second upper and 16 % second lower. As for Matriculation July 2006 as depicted in Figure 16, 16% secured First Class Honours, 58% second Upper and 26% second lower. Table 1.0 shows the range of CGPA for respective classes for Bachelor Engineering Electrical in UiTM.

Table 1.0

Class	CGPA
First Class	> 3.50
Second Upper	3.00 - 3.49
Second lower	2.2 - 2.99
Third Class	2.0- 2.19

Figures 14 and 15 clearly show that matriculation level entry students performed significantly better than diploma level entry students for academic program July 2005 to April 2009. However, as shown in Figure 15, there is no significance difference between the performance of matriculation batch of 2006 and diploma batch of 2007, which are students that took the same examination as they are in the July 2006 to April 2010 academic program.

From the graphs, for Ex-Diploma July intake 2006 students, 6.0% managed to secure First Class Honours, 55% second Upper and 39% second lower. For the Diploma intakes July 2007, 16% secured First Class Honours, 58 % second Upper and 27% second lower.

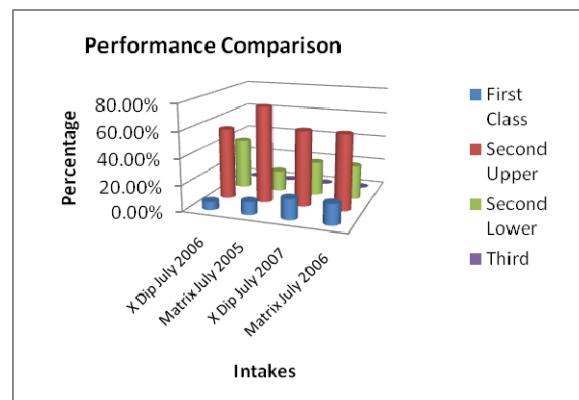


Fig. 14.0

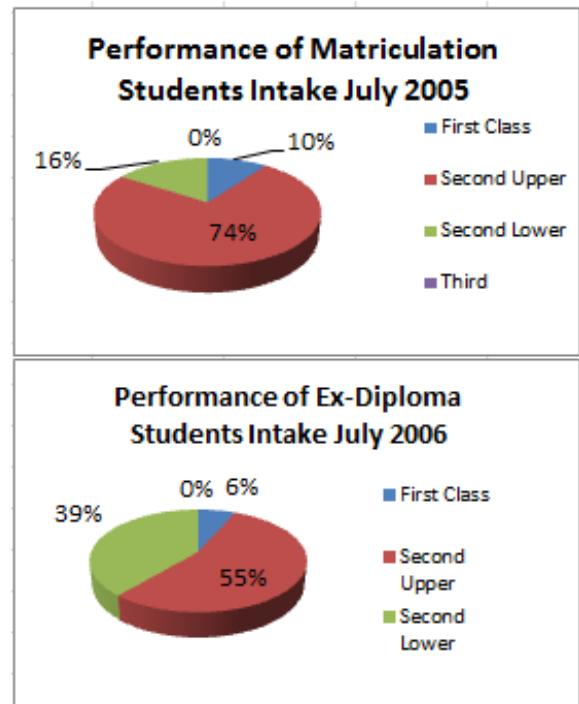


Fig. 15.0

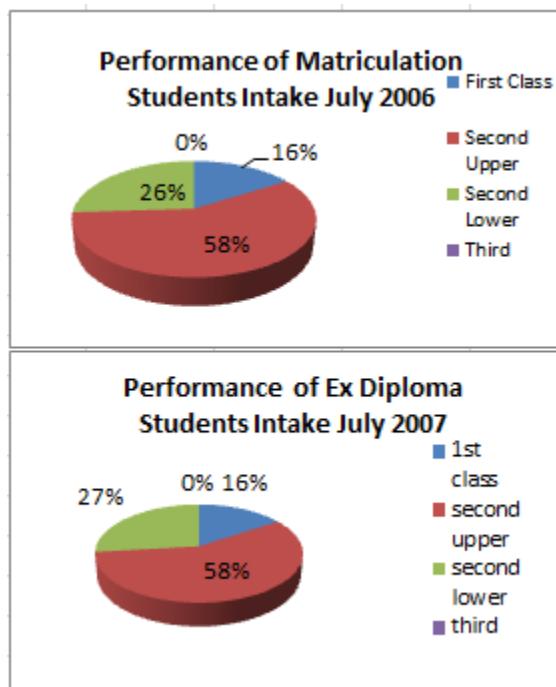


Fig. 16.0

As for the Ex Diploma Intake July 2007, there was a prominent increase in the First Class Honours, 16% from 6% in July 2006, as shown in Figure 17. The authors tried to trace back the entry CGPA at semester three of that batch to confirm the result and found out that their last CGPA at Diploma were very excellent indeed and significantly higher than the results of the July 2005 diploma holders. This implies that students of that batch have built up their ability during Diploma studies and maintained their momentum in ability continuously all the way through their Bachelor Degree program. Such students pursued their Degree Program immediately after obtaining their Diploma. They graduated with strong CGPA after given the chance during their Diploma Program and built up their ability and capability while undergoing the diploma program.

Hence the major determining factor to the performance of the students is strong ability of students in Mathematics and Physics at Matriculation and high final CGPA during Diploma level. It is assumed that those with high final CGPA at the end of the diploma program have a high mathematics and physic ability as in most cases they have high scores in courses that require mathematics and physic fundamental background.

V. CONCLUSIONS

The findings have shown that matriculation entry level student perform much better than diploma students. As the majority of Matriculation students have a higher mathematics and physic score in their secondary education compared to diploma students, it can thus be concluded that students with strong ability in Mathematics and Physics at the entry level of the Degree Program will have a good academic performance.

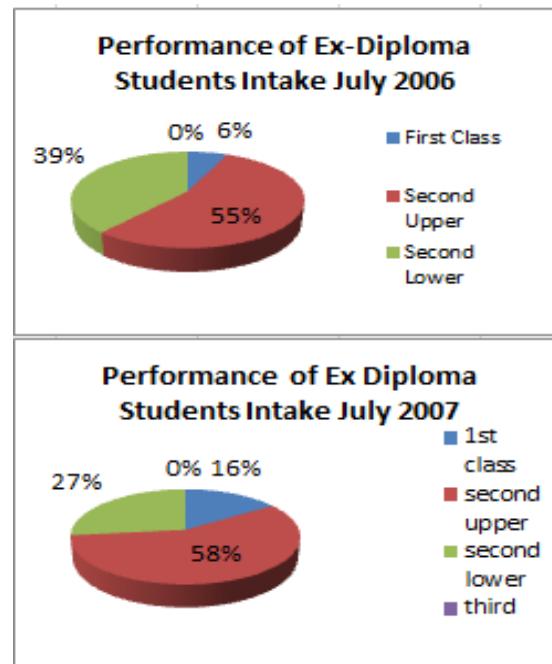


Fig 17

We hope that these findings would help academic advisors, lecturers, Program Coordinators to play active roles to motivate, advice and provide appropriate facilities and methods to improve mathematics and physics fundamental of students that have medium level academic performance. These findings could be used as guidelines to determine the entry requirements into the program.

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