

Evaluation of Academic Performance of Electrical Engineering Students based on gender and various entry levels.

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Abstract: - The enrollment of students in tertiary education throughout Malaysia shows an imbalance in terms of gender percentage. This paper investigates the female academic performance of Electrical Degree students at the Faculty of Electrical Engineering of Universiti Teknologi MARA's (UiTM) based on the student's entry levels. The study was based on the longitudinal progress based on three consecutive intakes of matriculation students namely July 2005, July 2006 and July 2007. We applied the same methodology to three other consecutive intakes of Diploma July 2006, July 2007 and July 2008. Cumulative Grade Point Average (CGPA) was used as the key performance index. In addition, this paper stresses on the total population of female students compared to male students. The outcomes of the research indicate that female students performed better than males in most cases. The strong ability in fundamental engineering foundation and self efficacy of the female students greatly influenced the overall academic performance.

Keywords: - female, academic performance, engineering foundation, self efficacy and CGPA

1 Introduction

MALAYSIA is one of the developing countries in the Asian region that has a well-established education system. Malaysian students have equal access to education, from nursery education to higher school education. [1] On the 8th March every year, the whole world celebrates women day and this year the theme is "Equal Access to Education, Training, Science, and Technology: Pathway to Decent Work for women". This is in tandem, with the national interest of the Malaysian Government to give equal opportunity to the female in education and to increase the workforce that includes female in the working-age population. [2]

In general, Malaysian students spend an average of thirteen years in primary and secondary schools before entering into Institute of Higher Learnings (IHLs). The results of "Sijil Pelajaran Malaysia" (Malaysian Certificate of

Education) which is equivalent to Ordinary level will determine whether they can register into matriculation or Diploma program. Matriculation program lasts for one year while the Diploma Program takes three years to complete. 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 as full time students or off campus. [1,3] 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).

1.1 Background to tertiary Engineering Education in Malaysia

Malaysia, then called Malaya achieved her independence in 1957. Then, there was no IHL offering tertiary engineering education. In 1955, a Professional Engineering Course was

established at the University of Malaya in Singapore, at that time a British Colony. Subsequently, the first Malaysian university to offer a degree in Engineering is University Malaya when its Faculty of Engineering was established in 1958. Approximately 50 years later in the year 2009, Malaysia has 20 public IHLs and 536 private Institutions of Higher Learnings offering various courses at diploma, degree and professional levels. [4]

Universiti Teknologi MARA (UiTM) is one of the public institutions of higher learning in Malaysia. It started off as RIDA (Rural and Industrial Development Authority) Training Centre (1956 -1965) with the objectives to rebuild the rural society, as well as improving the rural community's economy. In 1965 it was renamed MARA College (1965-1967) and subsequently upgraded to Institute Teknologi MARA (ITM) (1967- 1999) and to its current name UiTM on August 26th, 1999. One of UiTM's mission is "to improve the lot of the indigenous people to become professionals that are knowledgeable, innovative, competitive, morally sound and capable of leading the development of the country" through university education. [5].

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. [1]

To achieve its mission, UiTM currently offers Bachelor of Engineering Degree courses and various other professional courses such as Accountancy, Business Management, Information Technology and Quantitative Sciences, Architecture, Planning and Surveying, Applied Sciences and also Medicine and Health Sciences.

1.2 Students Performance Evaluation

Students Performance evaluation is of great concern to any University management. Upon finishing the final examination usually the Head of Programs has to table down the results of

students against the total of entry students at all courses. Some students can complete successfully on time while others cannot complete on time and needed longer time to complete the required credit hours. There are many factors that influenced the performance of students both male and female. Mikka [6] noticed that insufficient skills in basic mathematics cause problems for those majoring in engineering at university level and thus affecting their academic performance. Such is particularly true for electrical Engineering studies that require the skill of application of fundamentals concepts together with mathematics to solve many engineering problems.

Ariffin et al [7] asserted that the educational intelligence can be simplified as the ability to seek knowledge and to be make adaptations to the new situation based on current situation or environment. With regards to mathematics, the males perform better particularly in numbers and geometry. The females tend to solve questions related to memorizing facts and order problems. [8]

There are many factors that influenced student's academic performance in engineering studies. J Omar [9] pointed that teaching and learning technologies at a well equipped university are not sufficient enough as students need extra help from academic advisors to guide them to achieve their educational goals. This is particularly true for students who have come directly from high school or matriculation program. University life can be different and very challenging indeed where students must seek knowledge instead of fed with knowledge. University friends can also influence their attitudes towards life and personal skills as parents have little or no influence in the student's courses. Thus Academic Advisor (AA) can guide students to make decision to achieve the final academic performance having follow through the advisee right from the beginning of University life. [10]

In fact Bandura [11] suggested that individuals with high self-efficacy exhibit low anxiety, better working styles and better focus. Such self

efficacy beliefs promote better academic performance to any individual especially in the engineering courses.

CGPA is the one of the easiest indicator of student's performance as other achievement like personality traits are difficult to measure. Being the head for a Bachelor Degree Program for a number of years, we noticed that it is extremely difficult to increase the CGPA as the credit hours keep on increasing every semester. Normally we advise to students to score the maximum possible CGPA right from the start of semester system. Students are guided as how to calculate CGPA as shown in the Academic Regulation Handbook. In order to graduate, students male or female must undertake a total of 137 credit hours with a minimum CGPA score of 2.0 [12].

Research objectives

- i. To identify the total intakes of female students
- ii. To analyze any pattern or trends of female intakes
- iii. To study the performance of female students in electrical engineering only
- iv. To determine the factors that influences the female overall academic performance.

2 Methodology

The methodology used in the study is the longitudinal progress of students from different batches entering into the Bachelor electrical Degree Program. CGPA was the only parameters measured as far as academic performance of students are concerned. The first sample of the study was taken from first batch of students from Matriculation intake in July 2005. We noted the first semester CGPA of the students from matriculation and that of Diploma intakes. We also keep track of their CGPA results for every semester until graduation. Then we took the samples of students from matriculation intake July 2006 and July 2007. We track their performance using the same

longitudinal progress based on CGPA. The same procedure was applied to Diploma intakes to trace any pattern or trend of academic achievement.

3 Findings

We found the following observations:

A. Matriculation students

Based on Fig. 1 it can be seen that the total percentage of female students was only 30% of the total intakes from July 2005 through July 2007 for the Bachelor Degree Electrical Program.

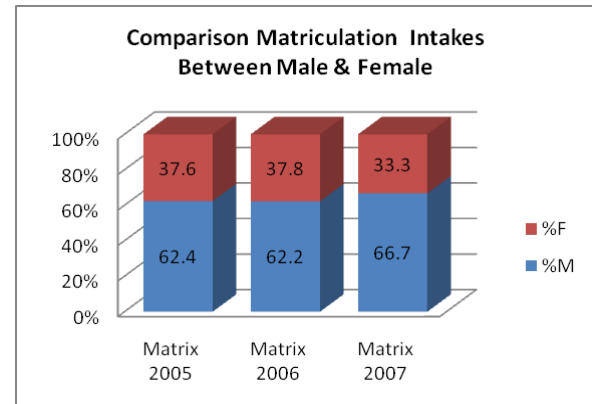


Fig. 1 Electrical Intakes Gender Comparison

Tables 1, 2 and 3 show the overall enrolment of matriculation students' intake July 2005, 2006 and 2007. From the tables above it can be seen that the total number of male students are higher than the female students as expected especially in the Science and Technology based program like Electrical Engineering Program. In fact such numbers of females are showing positively increasing compared in those years of 1980 through 1990 whereby the percentage was much lower.

Table 1 Performance Gender Comparison 2005

Matrix 2005	M	M%	F	F%
1st	4	8	3	9
2,1	28	56	23	69
2,2	10	2	2	6
3rd	0	0	0	0
Extended	8	16	5	15
Failed	8		2	
Total	58		35	

Table 2 Performance Gender Comparison 2006

Matrix 2006	M	M%	F	F%
1st	1	1.2	13	21.6
2,1	39	48	23	38.3
2,2	15	18.5	11	18.3
3rd	0	0	0	0
Extended	26	32	13	21.7
Failed	26		5	
Total	107		65	

Table 3 Performance Gender Comparison 2007

Matrix 2007	M	M%	F	F%
1st	5	1.2	16	21.6
2,1	39	48	34	38.3
2,2	29	18.5	3	18.3
3rd	0	0	0	0
Extended	33	32	9	21.7
Failed	26		4	
Total	132		66	

For intake July 2005, only fifty male students and thirty three female students managed to reach the final semester or the eighth semester. From that figure, eight male and five female students extended to complete the requirement credit hours to secure a Bachelor Degree. As for the performance comparison, the female did better in terms of percentages secured in the first, second upper and even the second lower. Table 4 shows the range CGPA for respective

classes award used for Electrical Degree Program in UiTM.

Table 4 Cut- off CGPA

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

The same comparison study was made to the following intake namely intakes July 2006 and 2007. The pattern seemed to be the same, whereby the female students have secured higher percentage in terms of classes be it in the first, second upper and even second lower. Such patterns of achievement were shown in Fig. 2, 3 and Fig.4 below.

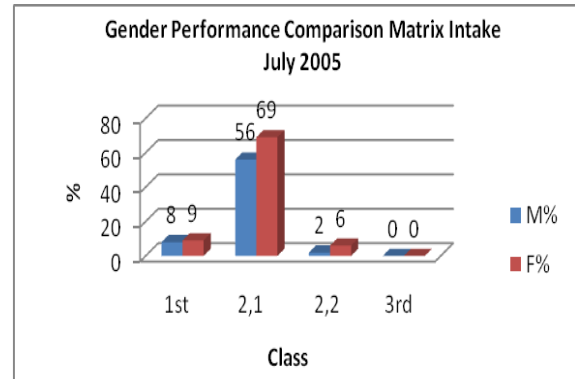


Fig. 2 Final CGPA Gender comparison

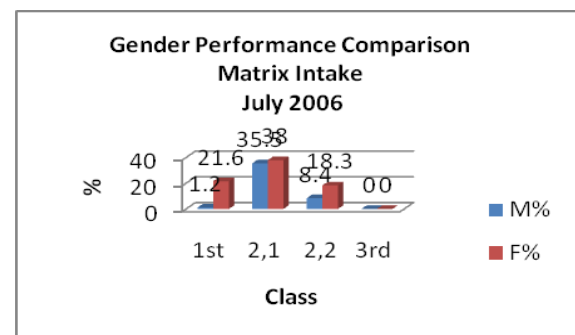


Fig. 3 Final CGPA Gender Comparison

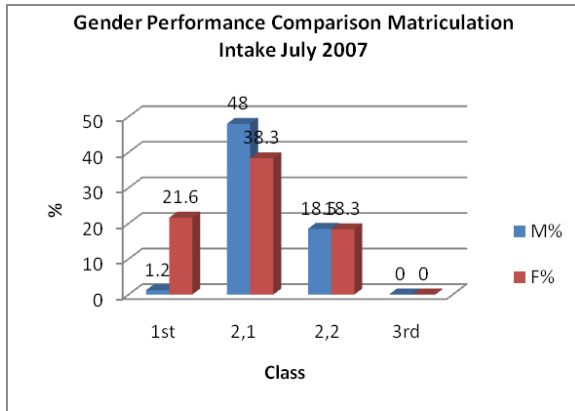


Fig. 4 Final CGPA Gender Comparison

Subsequently, a sample of above average or strong ability students were identified and tracked based on CGPA levels throughout their studies at the university. Fig. 5 shows that such students managed to maintain their performance all the way through until graduation despite that CGPA decreases a little bit. Such decrease is particularly true as the subjects matters are getting more complex and detailed as semester increases. STD3F refers to female student female.

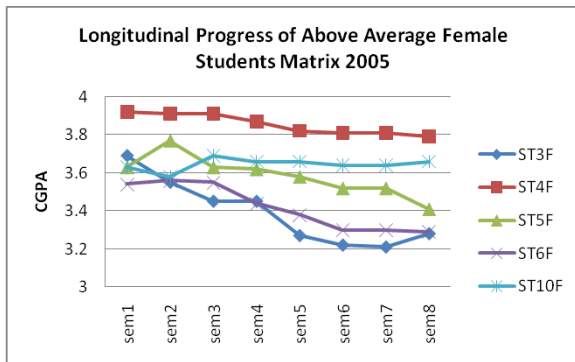


Fig. 5 CGPA follow through

On the other hand the average students whether male or female were unable to complete the prescribed courses within the specified time of eight semesters. A sample of those who needed more time to complete the Program is shown in Fig. 6. It seemed that their CGPA are below 3.00 and at times very alarming indeed. Such students needed longer time to complete the entire Program with reasonable CGPA upon graduation. Such students needed special advice and attention from their academic advisors to

maintain the momentum of their studies till the very end of Program. Early intervention by the AA on the academic matters can improve performance at early detection of such alarming CGPA. Such is depicted in Fig. 6. STF11M refer to male student while STF14F refers to female student.

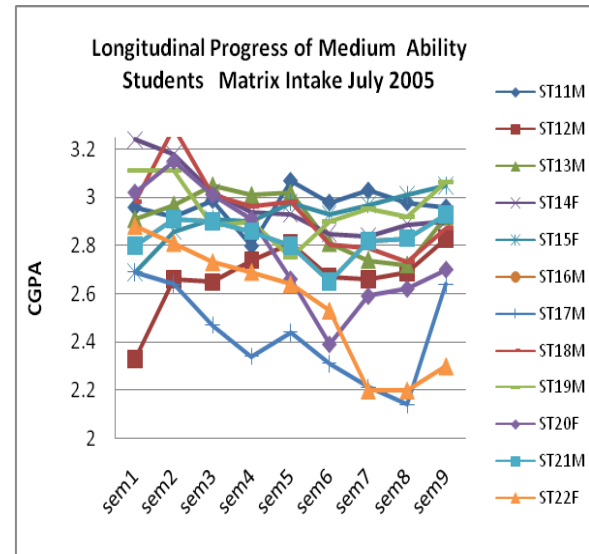


Fig. 6 CGPA follow through

B. Diploma students

The same process was applied to intakes of Diploma students mainly July 2006, 2007 and 2008. Such students in general can complete the Degree program within six (6) semesters with exemption of courses in the first and second semesters. [1]

The total number of female students was again highlighted as comparison of the overall students. Such is shown in Fig. 7 below. It can be seen that male students still form the majority while female students made up of 30% except in July 2006 where it reached 43.2% of total intake for the Electrical Degree Program. It can be seen that for both Matriculation and Diploma, the total female students would be just above 30% of the overall intakes of the Bachelor in Electrical Engineering program in UiTM. Such percentage can be less in other engineering courses like Civil, Mechanical and Chemical engineering. Such figure is expected to increase with the introduction of computer aided courses whereby the nature of study will

be user friendly to the female students particularly in Mechanical and Civil Engineering.

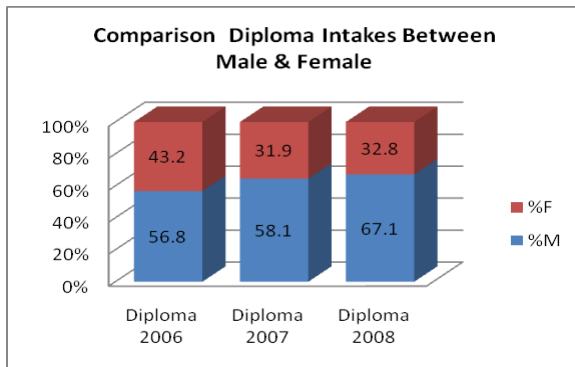


Fig. 7 Electrical Intakes Comparison

Tables 4, 5 and 6, shows the overall enrolment of diploma students mainly intake 2006, 2007 and 2008. Such students enter straight into semester three of eight semester system and they can in general complete their Degree Program within three years. It can be seen that the total number of male students are still higher than the female students.

Table 4 Gender Comparison Diploma 2006

Diploma 2006	M	M%	F	F%
1st	0	0	9	12.3
2,1	42	47.2	40	54.8
2,2	26	29.2	7	9.5
3rd	0	0	0	0
Extended	21	23.6	17	23.3
Failed	15		6	
Total	104		79	

Table 5 Gender Comparison Diploma 2007

Diploma 2007	M	M%	F	F%
1st	15	10.8	10	13.8
2,1	60	43.2	29	40.2
2,2	31	22.3	13	18
3rd	0	0	0	0
Extended	33	23.7	19	26.4
Failed	32		8	
Total	171		80	

Table 6 Gender Comparison Diploma 2008

Diploma 2008	M	M%	F	F%
1st	7	8.1	4	8.8
2,1	45	52.3	34	75.6
2,2	17	19.8	3	6.7
3rd	0	0	0	0
Extended	17	19.8	4	8.9
Failed	14		4	
Total	100		49	

From Table 4 it can be seen that fifteen (15) male students and only six (6) female students did not manage to reach the final semester. They either failed a course three times or their CGPA is much lower than 2.0 along the way. [8]

It can also be seen that 12.3% female students secured First class, 54.8% second upper and 9.5% secured second lower upon graduation. Fig. 7, 8 and 9 show the overall comparison of performance between genders for the Diploma intakes.

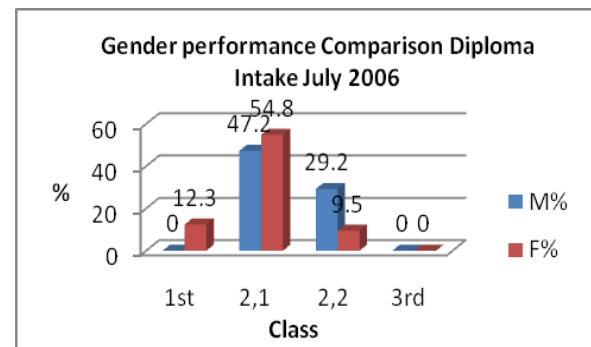


Fig. 7 Final CGPA Gender Comparison

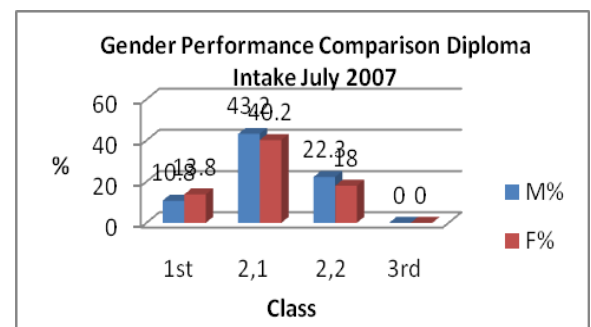


Fig. 8 Final CGPA Gender Comparison

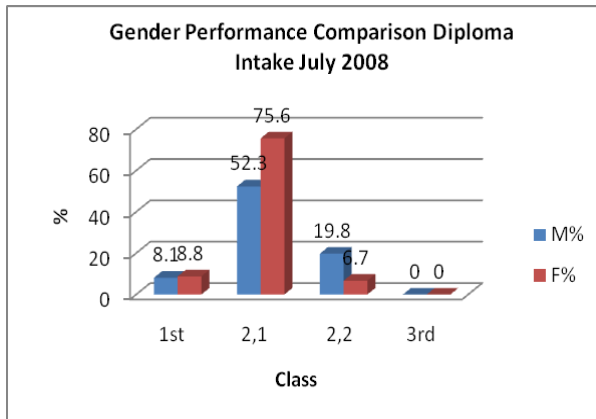


Fig. 9 Final CGPA Gender Comparison

As depicted in the graphs, it can be seen that female students did outstandingly well overall performance upon graduation for batches July 2006 and July 2008

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

As mentioned earlier students in the Matriculation intake of July 2005 sat the same final examination with the students of the Diploma intake of July 2006 .This due to the fact that Diploma students entered straight into 3rd semester of the same program

Fig. 10, 11 and 12 show such comparison of three different generations of students sitting for the same final examination.

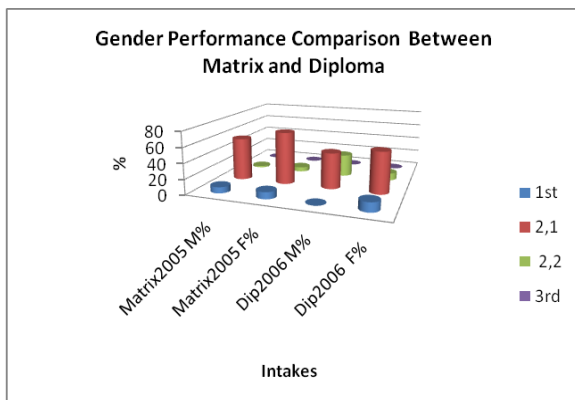


Fig. 10 Gender Comparison between Diploma and Matriculation

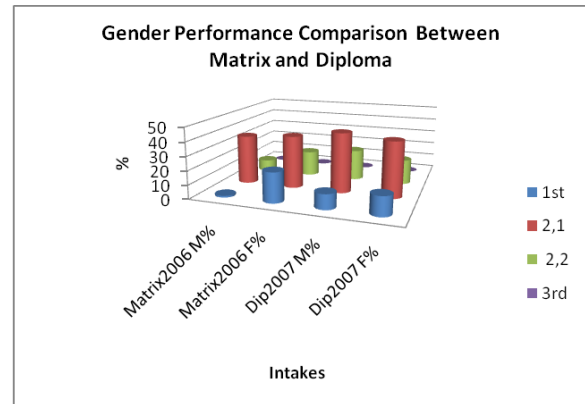


Fig. 11 Comparison between Matriculation and Diploma

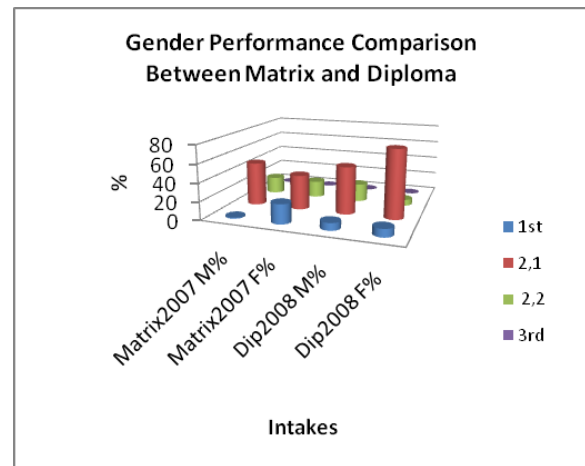


Fig. 12 Comparison between Matriculation and Diploma

From those figures it can be seen that the female students performed better in most cases except for Diploma 2007 whereby the male students did better. This was due to the fact those male students of that batch have built up their ability skills during Diploma studies and maintained their momentum in ability continuously all the way through the Bachelor Degree Program. In all other cases female students performed outstandingly well right from their earlier semester of the program. They seemed to be showing consistently stable even at higher semester despite subjects courses are more difficult indeed. Female students with strong self efficacy and abilities in engineering

fundamentals achieved higher academic performance due to high persistency and focus in their studies.

4 DISCUSSIONS

The findings indicate that in general, female students performed better than males in an academic environment having strong engineering fundamentals right from start of Program. However, other research have showed that as these graduates enter the working environment, more males rather than females applied to obtain to sit for the Professional Interview (PI) conducted by the Institution of Engineers Malaysia to enable them to subsequently on passing the PI to register with the Board of Engineers Malaysia (BEM) to obtain the professional status P. Eng. [13].

The PI failure rate for both genders is almost the same as shown in Fig. 13 below. However, the reasons for failure show correlation with this research. As depicted in Fig. 14 which shows reason for PI interview failure based on gender, the results indicates that the reason why males fail the PI is usually due to poor technical knowledge. Females, however usually fail the PI interview due to poor knowledge in the code of ethics for professional engineer.

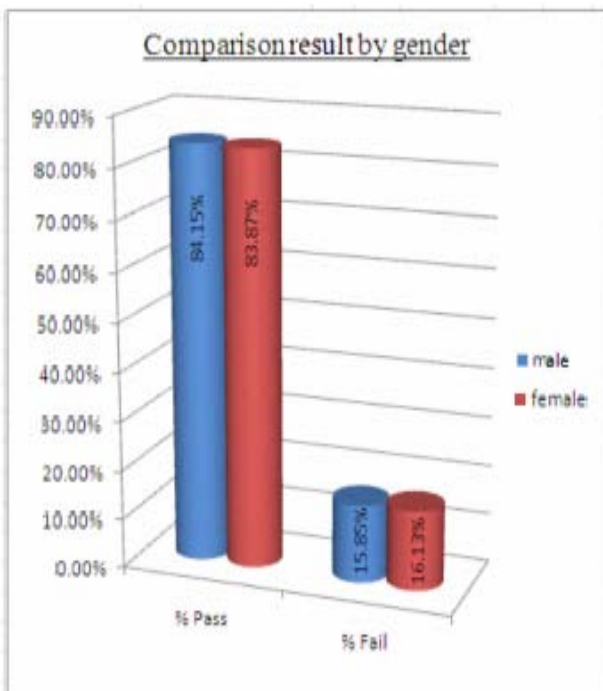


Fig. 13 PI pass/failure percentage of candidates by gender in 2009.

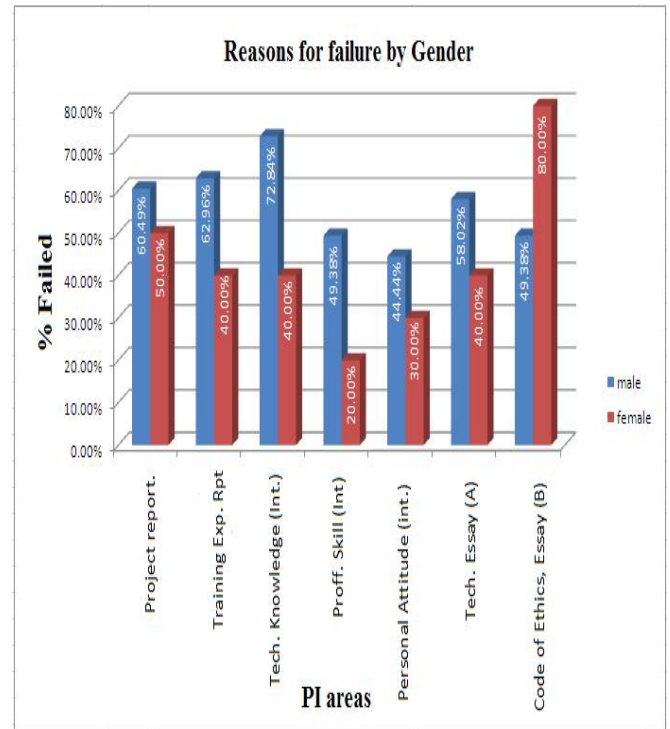


Fig. 14: Percentage of failure by gender for PI candidates in 2009

5 CONCLUSION

This paper evaluates the academic performance of Electrical Engineering students for various entry levels. We investigate the pattern of intake of electrical engineering students in particular from July 2005 onwards. The percentages of female students fall within 30% of the total intakes for both Matriculation and Diploma. The performance of the female students was also analyzed with respect to total number of students that managed to reach the final semester before graduation. It can be concluded that female students with strong ability in engineering fundamentals from the very beginning of program performed very well upon graduation. They maintained their CGPA throughout right from very early semester of their university life. It can be concluded that female students with strong self-efficacy tend to be more focus in their academic that promotes

better performance at the end of their academic courses.

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