

## REASONS FOR STUDENT DISCONTINUATION IN ENGINEERING DEGREE COURSES OFFERED AT A DISTANCE

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### ABSTRACT

Faculty of Engineering Technology of the Open University of Sri Lanka has been offering engineering programmes at a distance for the last two decades or so. However, completion rates in Faculty of Engineering Technology are lower compared to the other faculties of the University. This paper investigates the reasons for low completion rates in the faculty and suggests ways and means to overcome this problem. The study concludes that increasing student numbers will not necessarily increase percentage of students completing the programme though the number of students completing is increased. It is found that students offering courses for the first time in the system of distance education in their academic career perform poorer because they are not conversant with distance education techniques.

It is recommended that the Faculty must offer an orientation programme on distance education to all the students enrolling for the first time, before they commence their regular programmes. Further, it has been found that considerable percentage of students who obtain eligibility to sit the final examination by completing the continuous assessments do not sit the final examination. This has been found to contribute towards non-completion of programmes as students sitting the final examination in the subsequent years perform poorly in their exams. To overcome this problem, it is recommended that current practise of allowing the student to carry forward their eligibility to unlimited period of time must be disbanded.

**Keywords:** Engineering, distance education, discontinuation, drop out, non-completion.

### INTRODUCTION

Engineering education as it includes science and mathematics based subjects is traditionally the hardest to teach at a distance because of the need for hands on experience with the machines. However, the Open University of Sri Lanka (OUSL) ventured into teaching engineering at a distance in the early eighties as there was a need for engineering education to those who were employed in the various industrial sectors.

At that time it was envisaged that as distance learning is an excellent method of reaching the adult learner, this could be used to reach the industry personnel who are experienced but lack the theoretical background and know how of their technical competencies. Distance education is ideal for this segment of learners as the structure of distance learning gives adults the greatest possible control over time, place and pace of education. However, distance education has its own inherent problems which results in higher number of students discontinuing their studies. In recent years many discussions have taken place in the Faculty of Engineering Technology (FET) of the Open University of Sri Lanka on the comparatively low number of student completion.

As a result a study was undertaken to investigate the reasons for low number of student completion rates in the Faculty. This paper presents the results of this study along with the recommendations to reduce the student discontinuation at the Faculty of Engineering Technology of Open University of Sri Lanka.

### **RATIONALE OF THE STUDY**

It is a well known fact that the drop-out rates for distance education courses are usually higher than those for comparable on-campus courses (Kember, 1995). Studies consistently report that dropout rates are higher and course completion rates are lower for distance education courses than for their face-to-face course equivalents (Easterday, 1997; Roblyer, 1999; Carr, 2000). The problem of drop-out in distance education is widely recognised and has been subject to considerable investigation (Garrison, 1987; Cookson, 1989; Kember, 1989; Zajkowski, 1992). According to a study done on a broad range of correspondence-based distance education programmes undertaken by the World Bank the dropout rates ranged from 19 to 90 percent with an overall rate of 40 percent (Potashnik & Capper, 1998, p. 43).

The dropout rates at the FET are at the higher end of the range given by Potashnik & Capper. As a result of this poor performance, in the years 2000 to 2002 the FET embarked on various endeavours to improve the student completion rates. Number of courses of the Faculty were revised and improved in order to make the lesson materials easily readable and understandable. The curriculum was revised in such a manner that the student would be able to complete the diploma in a minimum of two years and the degree in a minimum of five years. Number of contact sessions at the entry level courses, were increased so as to give additional face to face support for the new students. Student intake was drastically increased through an enhanced marketing drive, on the assumption that increased student numbers would result in increased completion rates. Five years these initiatives were implemented it was apparent that there have been some positive developments towards improved completion rates among the FET students. However, in order to ascertain the exact impact of these changes, a detailed study was undertaken and the results and conclusions are discussed herewith.

The twenty years of experience gained by the Faculty of Engineering Technology of the Open University of Sri Lanka in imparting engineering education at a distance would be of immense value to other institutes all over the world that are currently offering engineering programmes or are planning to offer them in the future.

## METHODOLOGY

The Open University of Sri Lanka has a computer database of all its students from the year 1994. Thus for the purpose of this study the records of the students were studied from the database available in the university. Information on student enrolment, performance in the continuous assessments, and final examinations, from 1994 has been used. Sixteen different courses from various levels were selected and a comprehensive study was done on them. However, major emphasis was given to the courses in the Foundation levels as it was noticed that the most amount of non-completion occurs at these levels. The data has been analysed using the Microsoft Excel package. The results of these analyses along with the discussion are given below.

## RESULTS AND DISCUSSION

In the Open University of Sri Lanka, a student registering for a course in any programme of study is required to complete an assortment of continuous assessment components and obtain a minimum of mark of 40% to obtain the eligibility to sit the final examination.

Based on the nature of the course the continuous assessment components would vary from course to course. The final grade of the course is a combination of the marks obtained in continuous assessment and the final examination. In the Faculty of Engineering Technology the weightage is equal for continuous assessment and final examination.

For this study the details of students who completed the degree and diploma between 1994 and 2004 was taken into consideration. During this period, the curriculum was revised and a new curriculum was introduced in the year 2002. With the introduction of the new curriculum the minimum duration to complete the Diploma and the Degree were reduced by one and two years respectively. Further, certain courses in the entry level were revised and new materials were given to students.

However, for two courses these materials were given one year in advance; that is in the year 2001. Further, from the year 2001 a rigorous marketing campaign was carried out and the student numbers were increased considerably. Table: 1 gives the average student enrolment for the three entry level courses prior to and after 2001.

**Table: 1**  
**Student Enrolment in entry level courses - prior to and after 2001**

Course Title	Student No.	
	Prior to 2001	After 2001
Pure Mathematics	689	1544
Applied Mathematics	654	1562
Properties of Materials	509	1186

From Table: 1 it can be clearly seen that the intake of students has more than doubled after 2001.

### Performance of Students Enrolling for the Entry Level Courses

In the entry level of the engineering programme of the Open University of Sri Lanka, there three different courses. In order to determine how the students have progressed in their studies through the academic year in each of these courses it is necessary to analyse their performance in the continuous assessment.

In the Open University of Sri Lanka unless the students obtain a minimum of 40% marks in the continuous assessment they are not eligible to the final examinations of the corresponding course.

Table: 2 gives the average number of students who obtained eligibility to sit the final examinations in two of the entry level courses before and after the introduction of new lesson materials.

**Table: 2**  
**Students obtaining eligibility before and after revising course materials**

Course Title	Before Revision			After Revision		
	Student No.	No. Eligible	% eligible	Student No.	No. Eligible	% eligible
Pure Mathematics	659	167	25.4	866	362	42.3
Applied Mathematics	620	155	25.0	861	327	38.5

Table: 3 gives the average number of students who obtained eligibility to sit the final examinations in three of the entry level courses before and after increasing the intake. During the increased intake the students were also given new course materials.

**Table: 3**  
**Students obtaining eligibility before and after increasing the intake**

Course Title	Before Increasing Intake			After Increasing Intake		
	Student No.	No. Eligible	% eligible	Student No.	No. Eligible	% eligible
Pure Mathematics	689	195	28.3	1318	357	27.1
Applied Mathematics	654	180	27.5	1328	370	27.8
Properties of Materials	509	159	31.3	1186	262	22.1

Comparison of Tables: 2 and 3 suggest that when the course materials were revised and given without increasing the student intake drastically, there were an increased number of students obtaining eligibility to sit the final examinations.

However, when the student numbers were significantly increased by rigorous marketing campaign, though the number of students obtaining eligibility to sit the final examinations has almost doubled, there was no significant difference in the percentage of students obtaining eligibility.

In fact there is a reduction in the percentage in the Properties of Materials course. The reason for this being that though with the increased marketing drive and the open entry system practised by the Faculty of Engineering Technology (that is no formal entry qualifications or requirement to pass an entrance examination are required for students who enrol for the foundation level courses), faculty was able to enrol significant number of students who would be able to follow the engineering degree programme, it also brought in almost the same percentage of students who were not able to cope with the foundation courses that are required for an engineering degree.

These statistics suggest that even if the course materials are improved, if the students do not have the knack to study engineering there will not be any significant increase in the percentage of students completing the course.

However, it can be concluded that the revised course materials have definitely helped the students who have the ability to learn engineering related courses. This is evident from the statistics presented in Table: 4, which gives the percentage of students completing the final examinations before and after the revision of course materials and increased intake.

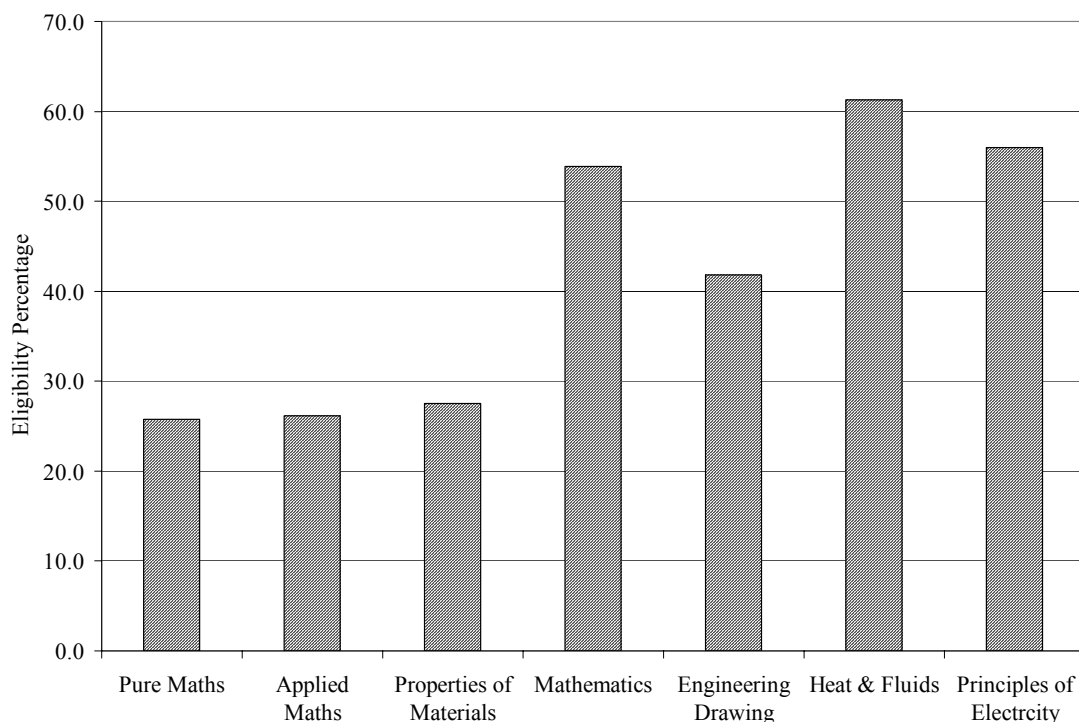
These results confirm the findings of Parchoma (2003), who states that by rapidly increasing the enrolments in higher education distance learning programmes, equally high successful completion rates may not be achieved.

**Table: 4**  
**Students completing the course before and after increasing the intake and revision of course materials (pass percentage among who sat the examination)**

<b>Course Title</b>	<b>Before increased intake and revision of course materials</b>	<b>After increased intake and revision of course materials</b>
<b>Pure Mathematics</b>	<b>38.6</b>	<b>47.4</b>
<b>Applied Mathematics</b>	<b>46.9</b>	<b>49.9</b>
<b>Properties of Materials</b>	<b>68.3</b>	<b>76.5</b>

### **Performance of Returning Students**

Figure: 1 gives the average percentages of students gaining eligibility for seven of the courses of the Faculty of Engineering Technology for the period under study.



**Figure 1:**  
**Average percentages of students gaining eligibility**

**From Figure: 1, it can be seen that in all the three courses at the entry level, Pure Mathematics, Applied Mathematics and Properties of Materials, the average eligibility rate is below 30%.**

**Further analysis of Figure: 1 infers that the students of Level 2 courses, (Mathematics, Engineering Drawing, Heat and Fluids, and Principles of Electricity) have fared better with higher eligibility rates. The figures being 61.3% for Heat and Fluids, 56% for Principles of Electricity, 53.9% for Mathematics and 41.8% for Engineering Drawing.**

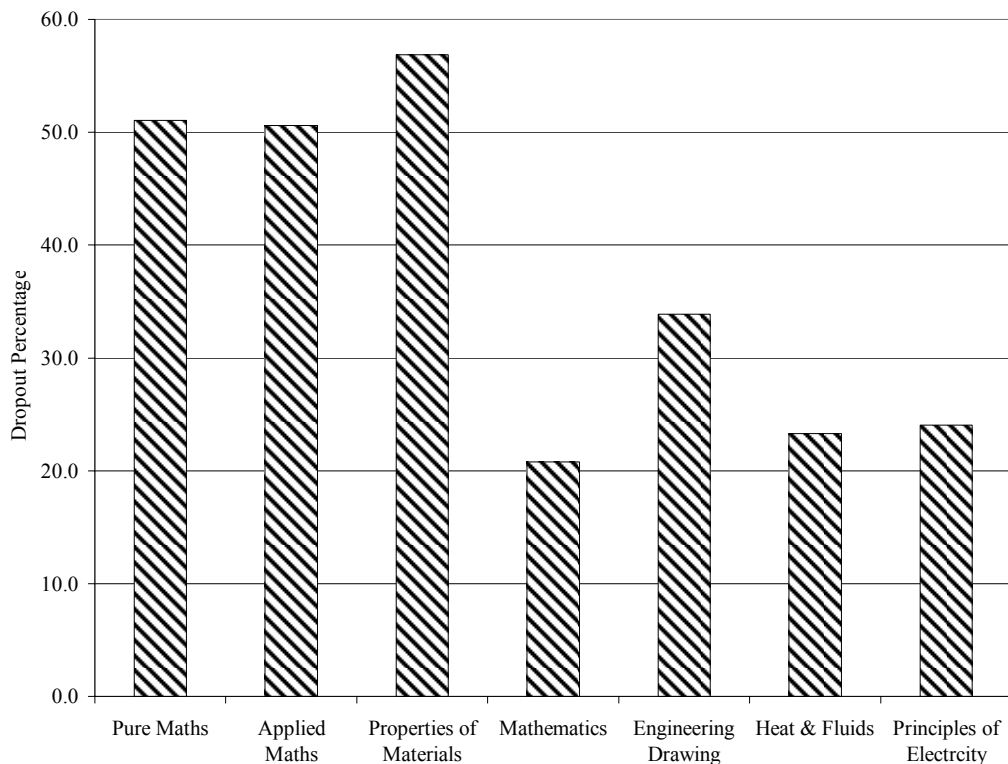
**These figures suggest that those students offering courses for the first time in the system of distance education in their academic career perform poorer. The reason for this is that they are not geared to follow the courses in the distance mode. Another reason is that most of these students have not successfully completed the General Certificate Examination (Advanced Level), which is the entry examination for the tertiary education in Sri Lanka, in the Mathematics stream.**

**However, as the entry level courses offered by the faculty are essentially courses equivalent to Advanced Level Mathematics stream subjects and are meant for students who have completed the General Certificate Examination (Ordinary Level), the primary reason for higher failure rates are lack of experience in self study through distance education.**

On the other hand, students who have followed a Level 1 course are in a better position to complete the course than new entrants. This can be further inferred from the fact that the least eligibility rate among the four courses in Level 2 is for Engineering Drawing, which also allows fresh students to register directly, whereas the other three courses have stricter pre-requisites of following all or most of the Level 1 courses.

These results confirm that a student who has an exposure to distance education has a better chance to complete the course successfully.

This phenomenon can be further confirmed when the average percentages of drop out rates of the courses are analysed as shown in Figure: 2.



**Figure: 2**  
**Student Dropout Percentage**

In Figure 2, the drop out rates of Level 1 courses are more than 50% whereas for the Level 2 courses excepting Engineering Drawing is just over 20%. Engineering Drawing has a drop out rate of 33.9%. Drop out rates are calculated by reducing the number of repeat students from the subsequent year from the current year failure (non-eligible) numbers. Repeat students are those who fail to gain eligibility in the previous year, but come back to follow the same course in the subsequent year with the intention of successfully completing it.

**Thus it can be concluded that a student enrolling in the Faculty of Engineering Technology of the Open University of Sri Lanka is in a better position to complete his programme if s/he has the skills of self learning prior to joining the programme.**

**This conclusion is confirmed by Moore and Kearsely (1996), who state that the development of self-directed learning skills is a factor in learners' success in distance learning. This is further emphasised by Areglado, Bradley, & Lane, (1996, p. 2) when they state that when a person leaves school today, he or she must not only have a foundation of knowledge but, more important, also the knowledge of a self-directed learner, prepared to keep on acquiring knowledge.**

**According to Gearhart (2002), who did a study on the effect of self-directed learning skills on the successful completion of an online course, it cannot be concluded that the orientation module assisted the learner's successful completion of the online course. She states that it may be that the learners were already self-directed and had sufficient technical skills to complete the programme.**

**However, other researchers too have found the benefit to learners orienting themselves to self-directed learning skills prior to beginning a course of study (Knowles, 1984; Foxx, 1990; Taylor & Burgess, 1995).**

**Thus this study suggests that in order to increase the success rates, the Faculty must introduce a compulsory course giving an orientation to distance Education.**

**In most instances the students who make use of the "open entry" philosophy adopted by the Faculty join the programmes without knowing the amount of commitment required to follow courses in distance education.**

**Thus when they face the challenges associated with the distance learning they drop out of the courses. If the students are made aware of the distance learning methodology and the commitment required from the student's side they would be able take up the challenges and would be able to succeed. This would help the Faculty to concentrate its limited resources on students who are better equipped to follow a programme in distance education.**

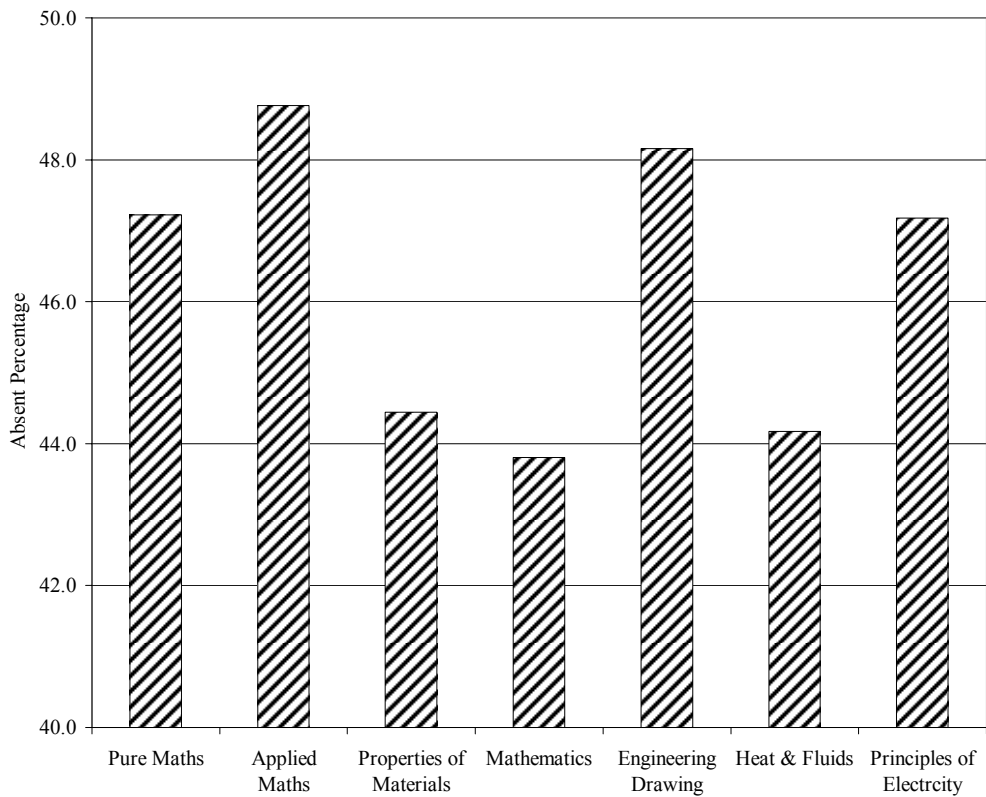
**The Faculty of Engineering Technology has accepted the conclusions of this study and has now embarked on offering a compulsory course module titled "Learning to Learn at a Distance" to all its new students from the next academic year. The effect of this orientation course on distance education, on the completion rates of the engineering courses could be evaluated in another two or three year's time.**

**According to this study another problem that was identified as contributing towards student non-completion is that the students who have obtained the eligibility to sit the final examination failing to turn up for the final examination.**

**This procedure of putting off a task beyond the time is known as procrastination. Figure: 3 gives the average percentage of students failing to sit the examination in the year they obtained eligibility.**



From Figure: 3, it can be seen that for all the courses, the rate of students not turning up for examinations is more than 43%.



**Figure: 3**  
Percentage of students postponing sitting of final examinations

This problem is further compounded by the fact that students who postpone sitting of the final examination perform poorly compared to those who sit the examination in the same year in which they got the eligibility. This can be clearly seen in Table: 5 where the performance of students postponing the examinations have performed significantly poorly compared to the students sitting in the same year of getting the eligibility.

**Table: 5**  
Performance of students in examinations

Course Title	Students Completing the Final Examinations (percentage)	
	Sitting in the year of eligibility	Sitting in the later years
Pure Mathematics	52.1	26.3
Applied Mathematics	58.1	29.9
Properties of Materials	75.5	50.8
Mathematics	62.1	26.9
Engineering Drawing	57.4	40.0
Heat and Fluids	78.4	45.0
Principles of Electricity	63.4	35.2

**One of the main reasons for students postponing the final examinations is that this facility is available for them at no cost, both financial and academic. Until recently, students were allowed to sit the final examinations any number of years after completing the continuous assessment. The students who do not turn up for examinations will not lose their grades either.**

**They will not be required to pay additional fee for sitting the examination in a subsequent year. However, recently the University has brought in a rule that the eligibility to sit the final examination cannot be extended beyond a period of five years. However, it the opinion of the authors that even five years is a too long a period to encourage the students to sit their final examinations. Probably two or three years after obtaining the eligibility would be the ideal maximum duration allowed for sitting the examination.**

**From the current academic year the University requires the students to apply for their final examinations. As a result of this it has been observed that the attendance among those who applied to sit the final examination is very encouraging, with 100% attendance in number of courses. Though this process has brought in financial savings to the university, it has not helped in encouraging the students to sit the final examination in the year in which they obtained eligibility. In order to encourage the students to sit the final examination in the year in which they obtain the eligibility, it is the opinion of the authors that an examination fee should be levied if the students postpone the sitting of the examination. This view of the authors has been endorsed by many faculty members of the University.**

## **CONCLUSIONS**

**From the study undertaken it can be concluded that even if the student number are significantly increased no marked changes in the percentage of students getting eligibility to sit the final examinations is noted. However, number of students completing the courses may be higher.**

**These findings suggest that those students offering courses for the first time in the system of distance education in their academic career perform poorer. The reason for this is that they are not geared to follow the courses in the distance mode. On the other hand, students who have followed a course at a distance in the University are in a better position to complete the course than new entrants.**

**Accordingly, in order to increase the success rates, the Faculty must orient the students on distance education prior to their entry into any of the regular programmes. Having this in mind from the academic year 2008/2009 the Faculty of Engineering Technology has decided to introduce a compulsory course named, "Learning to Learn at a Distance" for all students registering in the Faculty for the first time.**

**The students will not be allowed offer any courses in the second year unless they complete this course which would be conducted in a face to face manner to orient the students towards distance learning.**

Further, it is found through this study that many students who join the faculty do not have the knack to follow engineering but enrol in the Diploma programme because of the opportunity given through the open entry philosophy.

The Faculty has also decided to address this issue as well by introducing a separate foundation programme for all the students who have not completed the GCE (A/L) examinations in the mathematics stream from the academic year 2009/2010. It is expected that this step would discourage students who tend to join the programmes in Engineering at the Diploma level only because the entry is open.

Further, in order to discourage students postponing the examinations to subsequent years the University has introduced an "application for examination" process. However, unless an examination fee for students who fail to sit the examination in the first instance is introduced this endeavour may not bring in the desired results.

From the year 2007/2008 the university has also introduced a limit to which the eligibility of a course could be carried forward to five years from the hitherto unlimited period. However, this period is rather too long at the University must take steps to bring down the period to two or three years.

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