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## THE FUTURE OF ENGINEERING EDUCATION IN EGYPT

### 1. Introduction

When we speak about developing higher education, this include the curricula, laboratories, research equipment, classes, learning centers, text books, faculties, professors and students.

In my opinion, the faculties and their memebers represent the most important element in this development process. In view of this fact, the following steps are to be well thought-out:

- The number of students in the Faculty of Engineering, Cairo University increased from 5633 in 1994/1995 to 13403 in 2003/2004, with a rate of increase of 238%. Unfortunately, the number of faculty members does not match this rate of increase. It is thus required to form and prepare enough faculties to face the increasing number of students. This will cope with the standards of the students-to-faculty ratio.
- It is also important to obtain a realistic number of degree-level faculty members from reputable international universities; this will facilitate technology transfer and compensate for the noticeable decrease in the number of acting faculties.
- The decision maker should encourage, by all means, the faculty representatives, after concluding their degree or their post-doctor missions, to return and resume working in their mother universities. It is crucial to ensure a suitable standard of living and research environment in which persons can continue their research activities.
- Rules and legislations should be revised to limit the number of years may spend abroad in a mission or in joining his wife (for there have been extreme cases where faculty members have spent a rather long time abroad).
- The teaching load should be reduced and, instead, faculty members should be encouraged to carry out research in a suitable environment and pushed to attain higher academic positions, such as associate and full professorships through a reasonable number of years.
- It is quite important to find a balance between the capacity of faculty members and their ages, on one hand, and the needed concentration in teaching at under- and post-graduate levels and also with research activities on the other.

## 2. Principles and Bases of the Study

The present study deals with a dangerous phenomenon, one noticed in the last ten years in Egyptian universities regarding the decline in the number of the acting faculty members, in the different educational institutions, given the swelling in the number of students. Statistics show the students-to-staff ratio for the past ten years – and the projected ratio over the next twelve years. The study has investigated the situation in the Mechanical Power Engineering Department, Faculty of Engineering, Cairo University as a case study (which represents similar cases in other Engineering Colleges, too).

- The study is based only on the undergraduate load (while the postgraduate and research loads are overlooked).
- The study considers two successive periods -the past period (1994–2004) and the projected period (2004–2016).
- The Mechanical Power Department, Faculty of Engineering, Cairo University has been investigated as a case representing most of the Engineering Departments in the colleges of Engineering throughout Egyptian Universities.
- Projected investigations are based on three different cases:
- *First case* (The current situation): based on the actual numbers of students and faculty members, with a rate of increase of one faculty member every four calendar years. The member is either newly hired or returning from abroad.
- *Second case* (An optimistic one): based on the assumption that two new faculty members are joining the department every four years.
- *Third case* (A rather hopeful case): based on the assumption that three faculties will be added every four years.
- The study includes the actually existing number of staff in the Mechanical Power Engineering Department (those on leave are not counted for). Staff on leave represents about 22% of the total; the ratio is considered fixed throughout the projected twelve years.
- The emeritus professors are seen to be participating in the teaching process (under and postgraduate levels) despite the decree of the Supreme Council of the Universities offering a preference to the acting staff (persons under 60 years old) to teach the undergraduate courses.

## 3. Present Indicators

The trends and facts of the recent (1994–2004) that are used to predict the future expectations are as follows:

- The number of students in the Mechanical Power Engineering Department has increased from 362 students to 1052 with an increase rate of almost 290% (*Figure 1*).
- Only one staff member has joined the department in the last four years.
- The number of faculties has gone down from 55 members in the academic year 1998/1999 to 50 members in 2003/2004 (*Figure 2*).

- The loading factor (defined as the number of students per one staff member) was increased from seven in the year 1994/1995 to 21 in 2003/2004.

#### 4. Future Expectation

The essence of this study assumed that the ever increasing rate of students (*Figure 4*) and the rate of decline of the number of faculty members during the last ten years will be valid for the next twelve years *Table 1*. The following indicators (through the period 2004–2016) can be noted:

- The number of active faculty members (under 60 years old) will decline from 39 to 11 in the first case, to 14 with the second case, and to 17 if the (hopeful) third case happens.
- The number of emeritus professors (60–70 years old) will grow from six to 32, (if nobody passes away).
- The number of professors aged over 70 years will go up from 6 to 19.
- The loading factor, considering only acting staff, will increase from 27 (students/staff) to 207 in the first case, to 163 in the second case, and to 134 in the third case (*Table 2*).
- The loading factor, considering acting and emeritus staff, will increase from 26 to 108 in the first case, to 95 in the second, and to 84 in the third.

With the currently available statistics, *Table 2* shows the predicted numbers of the emeritus professors in the year 2009/2010 in some different departments of the Faculty of Engineering, Cairo University.

*Table 3: numbers of the emeritus professors*

Department	Number of emeritus professors
Architectural	30
Electrical Power and Machines	31
Electronics and Electrical Communication	36
Mechanical Power	31
Mining, Petroleum, and Metallurgy	33

The numbers indicate the similarities existing in all the departments; and it is thought that the situation would be the same throughout the rest of the Engineering Colleges in Egypt.

We are greatly convinced that e-learning will solve these escalating problems linked to the shortage of faculty members and the ever growing number of students. Collective learning can be created and diffused for all similar majors. The use of software packages can reduce the teaching load of the professors and, in parallel, increase self-learning and individual projects.

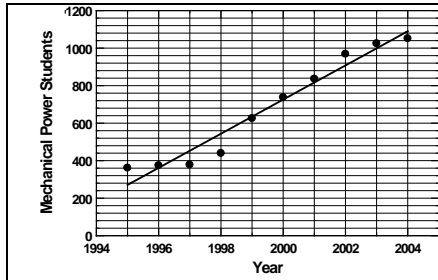


Figure 1: Number of Mechanical Power Students in the period 1994/2004

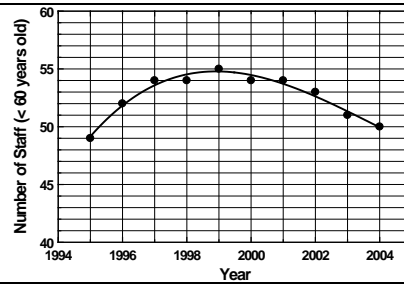


Figure 2: Number of Mechanical Power faculties in the period 1994/2004

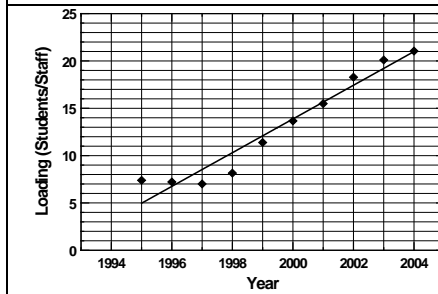


Figure 3: Loading factor in the Mechanical Power Engineering Department in the period 1994 to 2004

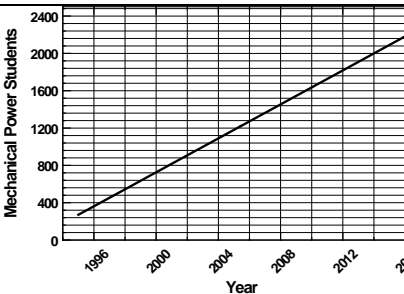


Figure 4: Expected growth in the number of students in the Mechanical Power Engineering Department in the period 1994 to 2010

Table 1: Expected number of faculty staff in the coming twelve years

Year	Acting staff (< 60 years old)	Staff on leave	Emeritus Professors (60 – 70 years old)	Emeritus Professors (over 70 years old)
2004	39	11	6	6
2008	30	8	18	7
2012	20	6	27	11
2016	11	3	32	19

Table 2: Expected number of students and the loading factor in the coming twelve years

Year	Equivalent staff*	Students	Students per equivalent staff	Students per acting staff
2004	41	1052	26	27
2008	35	1545	44	51
2012	28	1909	68	95
2016	21	2273	108	207

\* Equivalent staff = Acting staff + 0.3 (staff 60 – 70 years old)

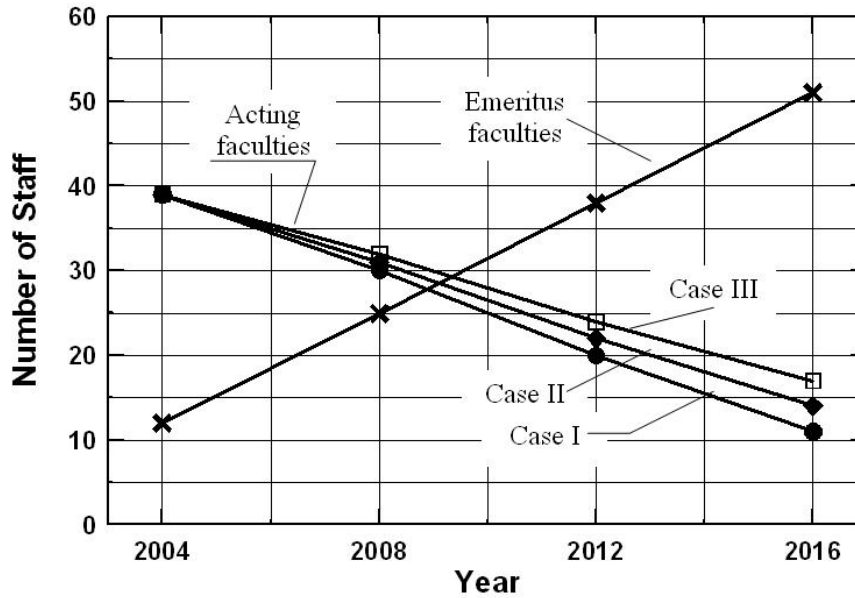


Figure 5: Expected number of faculty members in the mechanical Power Department in the period 2004–2016

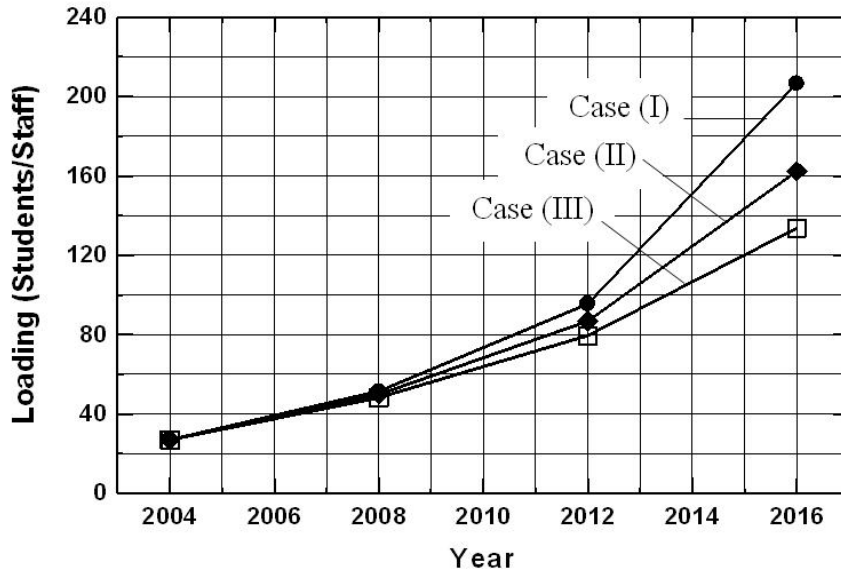


Figure 6: Expected loading factor in the mechanical Power Department in the period 2004–2016