# Repositioning the Current Electrical Power Engineering Curricula to Stimulate More Interest.

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## ABSTRACT

This article analyzes the current curricula in electrical power engineering with specific emphasis on the declining interest of prospective and trainee engineers in recent years as a result of the weaknesses associated with the curricula. The factors that propagate these weaknesses were discussed and measures of redemption on the part of curricula were also articulated. The need and knowledge of how to bridge the increasing gap between skills acquired from universities/polytechnics and electrical power industry were also highlighted. Some of the schemes that could be employed to attract both prospective and trainee engineers to develop interest in electrical power were also discussed.

(Keywords: engineering curricula, industry requirements, educational gaps, tertiary education)

## INTRODUCTION

This paper analyzes the challenges that face the current educational curricula for electrical power engineering, from the viewpoint of young people who are contemplating their future academic studies and from the viewpoint of the electrical power industry.

From the perspective of young people contemplating their future and the possibility of academic study in electrical power engineering, the current curricula in are unattractive. This apathy is expressed in the enrolment of students into power engineering as reflected in Figure 1, which shows students' enrolment into Electronics/Telecommunication options as compared with Power/Machine options for a period of five years in Waziri Umaru Federal polytechnic, Birnin-Kebbi.

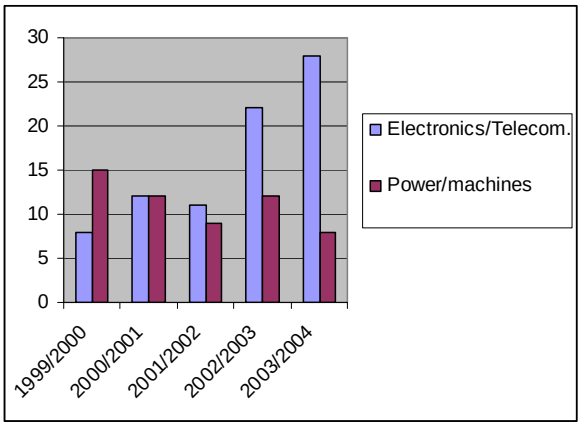
Analysis shows that the driving forces of industry have changed through the years. This change is reflected, among other things, in the required qualities of young engineers. From the perspective of industry, it observed at this juncture, that a meaningful discrepancy exists between the current education programs for electrical power engineering and the contemporary requirements of industry.

## WHY REPOSITION THE CURRENT POWER ENGINEERING CURRICULA?

Running electrical power engineering programs by educational institutions requires numerous facilities such as high-voltage engineering laboratory, machines laboratories, and power generation, transmission and distribution modules, to mention few. These facilities are highly capital intensive in comparison with the requirements for running electronics/ telecommunication engineering options. There is no doubt that this has resulted in most institutions awarding degrees/diplomas in electrical engineering under the two major options of electrical power/machine and electronics/telecommunication to provide more attention to the electronics/telecommunication option (this is not to blame administrators of such institutions as resources are scarce and outputs of investments need to be maximized).

Largely as a result this, such institutions have inadvertently provided sufficient practical coverage for electronics/telecommunication option while practical coverage in power/machines options has declined. Teaching of theoretical concepts in electrical power engineering without sufficient practical coverage (which makes theoretical concepts sensible to students) slows down interest and curiosity of

young secondary/high school students, who no doubt shop for courses/programs before they decide on a major. Figure 1 illustrates declining enrolments of students in electrical power engineering in comparison with electronic/ telecommunication in Waziri Umaru Federal Polytechnic.




*Source: Exams and Records, Waziri Umaru Federal Polytechnic, Birnin-Kebbi.*

**Figure 1:** Comparison in Enrolments of Students into the Two Options of Electrical Engineering.

As an undergraduate student of electrical/ electronics engineering, one would major in the final year. Experiences of the first three or four years usually largely contributes to decisions on the choice of majors (i.e., in the electrical power and machines option or not). From experience, one could conclude that component costs and ease of implementation of final year project design is one single factor that largely determines the choice of majors in electrical engineering.

Unlike projects in the electronics/ telecommunication option, which are relatively cheaper and smaller in size and therefore less delicate to carry, projects in electrical power/machines are usually very expensive, large, and cumbersome to carry. In addition, students find delight in the relatively easier-to-finalize project topics in the electronics/telecommunication option. This is because projects in this option can be easily obtained, along with theoretical and design concepts, through the World Wide Web. Consequently, many undergraduate students that would have opted for the power/machine option had opted for the electronic/telecommunication option.

In the opinion of the author, the current curricula in electric power engineering are not sufficiently innovative to engender increased interests in the power/machines option. Another reason why it is essential to review the current curricula is its lack of necessary synergy between fundamental and contemporary needs of the electrical power industry and the skills acquired from training institutions (universities and polytechnics). This disconnect is a result of the ever changing drivers of the priorities of industry as dictated by the society and stage of industrialization.

## FACTORS DRIVING THE ELECTRICAL POWER INDUSTRY

Historical development tells us that plus or minus twenty (20) years from now, global development will likely experience three dominant driving E-factors, namely: Engineering, Economics and Environment [1].

Depending on local growth circumstances, these drivers will rank differently. In industrialized countries, the current dominant driving force of electrical power industry is the Economic factor. In such countries electrical infrastructure has reached a mature level, to the extent that engineering is no longer the primary objective, but rather, its economical production, utilization, and improved service delivery is the major driving factor. On the other hand, some developing countries have high growth rates, and therefore are involved in building new infrastructure projects such as electric power systems.

Ozone depleting substances are one of the major threats currently facing planet Earth. Future technology should include more sustainable solutions for power processing, energy storage, and social and societal demands. Environmental concerns are expected to impose higher requirements on societies and international treaties. In favor of the environment, merits could be found through application of small and medium scale decentralized electrical power generation (micro power, like fuel cells) growing into the distribution system.

The deregulated, competitive utility industry needs engineers with broader educational backgrounds [2]. Basic knowledge in economics and management, together with communication skills, are required in addition to engineering knowledge. Indicators of this trend are already

obvious, for instance, the popularity of engineers with additional Master of Business degree credentials is increasing. The question for universities and polytechnics is how should the curricula be repositioned to stimulate more interest in electrical power engineering in order to meet society's needs of the near future? An extensive inventory of how the curricula could be modified to address both the decline in interest in electrical power engineering and the needs of society is given in [3].

In the medium to distant future, engineering will no longer likely be the dominant driving force but it will remain the basis upon which students have to learn how more complicated and more challenging solutions for technology applications have to be founded. For universities and polytechnics, this implies that the curricula have to be modified to factor in the dynamism of the top layer drivers of electric power industry, see Figure 2.

## ATTRACTING YOUNG STUDENTS TO ELECTRICAL POWER ENGINEERING

It is essential to distinguish between high/secondary school students who are on the edge of making a decision on the course of further education and young undergraduates who contemplate on fields of specialization.

**Secondary School Students:** It is essential that young potentials engineers are addressed directly and timely because they do shop around for career information before deciding on what career path to follow. In this age, the first market for the young generation is the Internet. This market is sufficiently large and therefore offers enough opportunity for universities, polytechnics, colleges and non–governmental organizations (both local and international) to reach out to these young minds.

The Institute of Electrical and Electronics Engineers (IEEE) has a dedicated website for students who have already chosen a career in a technical field. Organizations such as IEEE and United Nations Education, Science, and Cultural Organization (UNESCO) could develop and maintain websites for young minds. At such websites secondary school students should be able to find information on the newest findings and revolutionary developments coming up in the electric power industry in all its multi-disciplinary fields. Such websites should have high quality, ease of accessibility, and modern presentations like puzzles, games, music, pictures and movies, all in downloadable formats. They should provide chat boxes for subjects such as fuel cells, hydrogen power, energy storage, and greenhouse effects. Such websites should be updated regularly and recommended to secondary school students by their teachers. These websites could be designed with flashing adverts on popular browsers such as internet explorer, Mozilla Firefox, and Opera as well as search engines such as Google, Yahoo, and Kosmix.

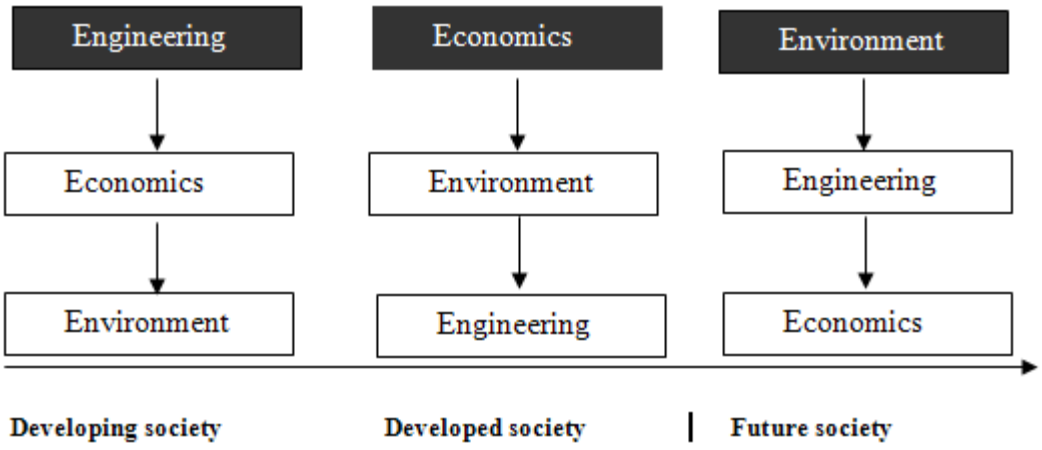



**Figure 2:** EEE Drivers of Electric Power Industry.

**Young Undergraduates:** To stimulate students' interest and enhance comprehension in electrical power engineering the use of tools such as computer software and multimedia is encouraged [4, 5, 6]. In the author's opinion, students' interests will be meaningfully stimulated, their comprehension considerably facilitated, and specialization in electrical power engineering improved if students are given sufficient opportunity to demonstrate and practically implement theoretical concepts of power engineering. Learning from experience is of fundamental benefits for students analytic and synthetic skills [1].

For the near- and intermediate-future, a number of challenges can be defined and a range of "hot topics" can be identified [1, 7], among which include the following:

- Energy storage (a condition for large-scale implementation of wind energy).
- Distrusted power generation.
- Superconducting transmission (very high energy diversity connections and very long distance transmission lines).
- Introduction of nano-technologies and embedded sensors.
- Clean technologies (distributed and renewable power systems, fuel cells).
- Power electronics.
- Asset management, IT support systems and power trade.

Most of these are subjects of pioneering research work in electrical power engineering. It will considerably stimulate young undergraduates to specialize in electrical power engineering if these are introduced to students in a multidisciplinary approach through appropriate media.

## CONCLUSION

This article analyzes the current decline in the interest and enrolment of students in electrical power engineering. It is shown that over the years, the factors that drive the electric power industry have become dynamic with dominance depending on the stage of industrialization. It has been pointed out that not only does the current curriculum lack the necessary synergy between industry and training institutions, but it has also become unattractive for both students who have not decided on what future career to take and electrical engineering students contemplating a field of specialization.

In order to reposition this trend, both the curricula and the methodology of approaching young people should be re-branded. It is essential to note that with today's youth, almost all, are aware of "Where" to find information, but are only confronted with a challenge of "What" to find. Therefore, learning and instructional methodologies should take into account the students' perception of learning by employing contemporary media of dissemination. Also, the re-positioned curricula should place more emphasis on inter-disciplinary skills. In addition, forums which would provide platforms for training institutions and industry need to stay abreast of the "needs" and "expectations" of modern industry in the repositioned curricula.

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