Strategies and Technologies for Electrical Engineering Education

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Abstract: This paper presents the remarkable developments taking place in electrical engineering education. In view of fast changes in the industry, an increasing proportion of electrical energy is used (Examples: lighting of shops, offices, dwellings and outdoor lighting). There would be no broadcasting and television systems, no telephone communication or telegraphy without electrical energy. For the benefits of society, electrical engineering established itself as a well-respected profession. As electrical engineers involved in a variety of fields and interact with other professions, in order to ensure that they are properly prepared for their careers. So, there is an urgent need for adequate exposes towards electrical engineering education. So, latest software tools are needed to enhance new activities in electrical engineering education.

Keywords: Electrical Engineering, SCADA, DSP, Deregulation

I. INTRODUCTION

The history of electrical engineering education parallels the development of the electrical manufacturing industry. Electrical and Electronics Engineering (EEE), the branch of engineering concerned with the practical applications of electricity in all its forms, including those of the field of electronics. Electronics engineering is that branch of electrical engineering concerned with the uses of the electromagnetic spectrum and with the application of such electronic devices as integrated circuits, transistors, and vacuum tubes. The electrical experimenters, innovative entrepreneurs and inventors such as Edison, Bell, Sprague, Thomson etc., who developed the early practical applications of electrical phenomenon, were either trained in related disciplines or did self-trained resourceful thinkers possess elements of genius [1]. However once industrial applications had been developed to the point where there were electrical installation to be design and electrical equipment's to be manufactured, for design , test and improve this equipment's a need existed for trained electrical engineers. So, the techniques used to educate future electrical engineers need to integrate innovative teaching methodologies with today's technology in order to reach and motivate students, faculty and professionals that will be involved.

II. ACTIVE TEACHING STRATEGIES FOR ELECTRICAL ENGINEERING EDUCATION

Active teaching strategies motivate students to do more than just listen and take notes in the classroom. Active teaching methods engage and inspire students to become more involved in their education. Student's motivation and learning styles are two basic points of active Teaching methods. Actual research questions and practical engineering problems derive the active educational exercises [2]. By integrating practical examples and industrial case studies into the engineering education, helps to motivate the students in relevant area. So at the end of four years of engineering education, students able to know simulation as well as hardware design. This exposure helps to students to meet their

industrial needs to serve the society. Electronic media can also help faculty members to meet these needs and integrate analysis, experimentation, visualization and team-based problem solving coupled with real-world applications [3].

III. COMPUTER-BASED ASSESSMENT SYSTEM

Computer-based assessment system has been developed at the University of Luton. The system uses 'Question Mark Designer' software to deliver end-of-module examinations namely formative assessment and self-assessment. Academic staff time of 50% was immediately noted. In successive years there was a further saving of 50% [4]. Computers can also help students with opportunities to practice their skills informally and receive quick feedback without extensively increasing workload of instructor. These opportunities can be made available to students whenever and wherever they have Internet access, thus enabling students to learn by trial and error without penalty or loss of face [5]: "the greatest value of computers is that they will watch out for you and let you do stuff without fear of embarrassment" [6]. Student and academic staff responses to computer-based objective testing were favorable. The benefits of no marking, fast feedback and comprehensive statistical analysis are offset against the time taken to design objective tests.

IV. RECENT TRENDS IN ELECTRICAL ENGINEERING EDUCATION

Some latest researches involved in this field are SCADA, DSP, and Deregulation of Power Sector etc. The information technology revolution has been built-in large part - on the development of this field.

A. SCADA - Supervisory Control and Data Acquisition

In power systems due to complex nature of bulk power handling, critical installations like electrical sub-stations are always been closely monitored. Conventionally, this has been achieved by maintain staff at every substation for operating & maintenance. But, nowadays with increasing number of sub-stations and constrains to decrease operational costs, it is not possible to maintain staff every new substation. On the other hand, at the data gathered in the sub-stations is gaining strategic importance in planning & operations of power system. It is desirable to have quick data acquisition and instantaneous response to any event, with minimum human interference. In such situation concept of SCADA is preferably suited [7]. Fig.1 shows the simple SCADA system with single computer.

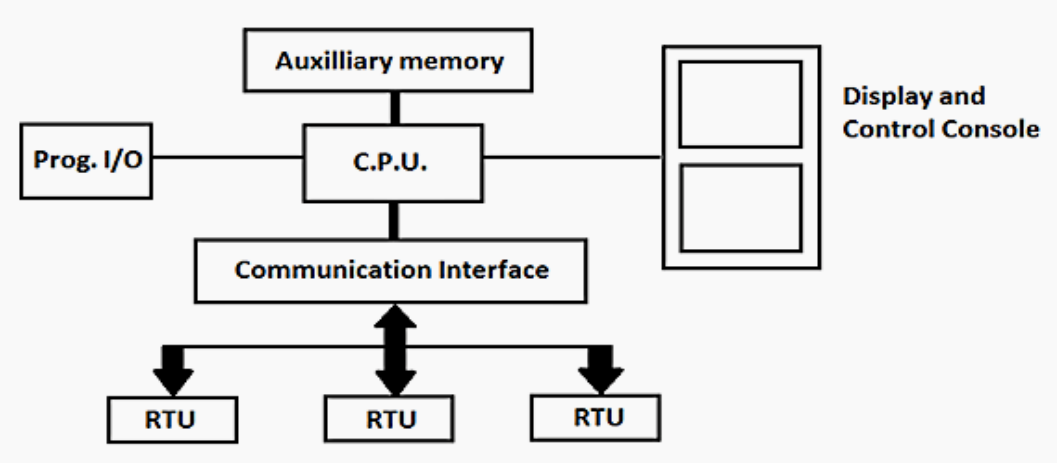

Figure 1. Simple SCADA system with single computer

Components of SCADA

1. Human Machine Interface (HMI): It is an interface which presents *process data to a human operator*, and through this, the human operator monitors and controls the process.

2. Supervisory (computer) system:It gathers data on the process and sending commands (*or control*) to the process.

3. Remote Terminal Units (RTUs): It connect to sensors in the process, converting sensor signals to digital data and sending digital data to the supervisory system.

4. Programmable Logic Controller (PLCs):It is used as field devices because they are more economical, versatile, flexible, and configurable than special-purpose RTUs.

5. Communication infrastructure: It provides connectivity to the supervisory system to the Remote Terminal Units.

Benefits of Implementing SCADA systems for Electrical Distribution systems are

- Increases reliability through automation
- Eliminates the need for manual data collection
- Alarms and system-wide monitoring enable operators to quickly spot and address problems
- Automation protects workers by enabling problem areas to be detected and addressed automatically
- Operators can use powerful trending capabilities to detect future problems, provide better routine maintenance of equipment and spot areas for improvement
- Provides the ability to view data in various ways to improve efficiency

B. DSP- Digital Signal Processing

Digital Signal Processors (DSP) based Control of electric drive systems is today a very common task. Faster and more functional units have made it possible to base the entire control system around the DSP without the need for additional components. As the processor lacks the ability to supply the outer world with desired power, an interface to external equipment, such as frequency converters, is required. While DSP based protection, systems play a very significant role in power systems – namely in Cost efficiency, Functional flexibility, Self-checking capability, and Adaptive relaying features [8]. Fig.2 shows Controller outline for the DSP system.

C. Deregulation

Electric deregulation is the process of changing rules and regulations that control the electric industry to provide customers the choice of electricity suppliers who are either retailers or traders by allowing competition. Deregulation improves the economic efficiency of the production and use of electricity. As a result of competition in the electric industry, the power prices are likely to come down which benefits the consumers. For example, price based unit commitment and optimal power flow solutions

with bidding generations and loads characteristics in the present scenario is totally different compared to a regulated set up. However, in both the operating and business sector of the electric utility industry the demographics of power generation, transmission, and distribution are changing vividly due to deregulation of power industry [9].

The main objectives of the deregulated power market:

- To provide electricity for all reasonable demands
- To encourage the competition in the generation and supply of electricity
- To improve the continuity of supply and the quality of services
- To promote efficiency and economy of the power system

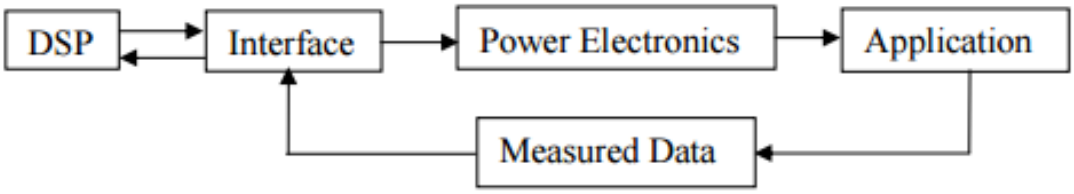

Figure. 2. Controller outline for the DSP system

V. CONCLUSION

This paper presents the significant developments taking place in electrical engineering education in view of speedy changes taking place in the industry. Nowadays, computers influence almost every part of our work and home as well. However, with all this computing power available, we still have only begun to scratch the surface of how we may harness technology to improve education in electrical engineering. Therefore, electrical engineering educators are required to improve the electrical engineering education curriculum equivalent with advancement of the structure of power industry. So that, the outgoing researchers and students can face the challenges with recent deregulated power industries.

Conflict of interest: The authors declare that they have no conflict of interest.

Ethical statement: The authors declare that they have followed ethical responsibilities.

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