Chapter 1

Introduction

Background of the Study

The training grounds for real-life work happens inside the school, and real-life work inside the school occurs inside the laboratory. The laboratory environment is a place for interactive learning. Inside it, students can simulate the experience of conducting realistic tasks that prove the imagery projected by the concepts and theories discussed to them in the lecture classes. This is also where students can commit mistakes without worrying about the consequences that may affect them greatly. Laboratories must always be able to encourage student-machine interaction and should always incorporate problem-solving and troubleshooting.

In the field of electrical engineering, the first machines that are introduced in undergraduate school are DC machines. Understanding the basic concepts and theories that govern the operation of these machines prepares the students to a more complicated discussion of AC machineries, apparatus, and eventually, complex grid systems. As a prerequisite in the electrical engineering curriculum, a laboratory focused specifically in DC machines is required to be taken. Majority of this course revolves in the operation and behavior of DC motors. It is of utmost importance for electrical engineering students to fully understand these concepts, hence, it is also of huge priority that the hindrances in learning these topics is also addressed in order to formulate the corresponding solutions for each. Erratic data, unfamiliarity, electrical faults, and paper-based processes, to name a few, are the obstacles encountered by students inside the laboratory.

In a study in 2012 by Bentounsi, Djeghloud, and Larakeb, a virtual laboratory is developed in order to help students cope up with the unfamiliarity of the machines. The researchers proposed a way of modernizing the laboratory while also reducing the errors committed in inputting and gathering data, making the laboratory less intimidating to unexperienced students, and maximizing the time consumed inside the laboratory.

In another study, Chin (2014) proposed an educational platform that will improve the evaluation of the experimental data gathered by the students. In this study, the researcher utilized a program that gathers the data from actual electrical machines as the students are conducting a manual experiment. Afterwards, when the students submit the data acquired in the experiment, the program compares it to its own recorded measurements. Consequently, the program also evaluates the performance of the students based on the accuracy of the data.

The researchers are devoted in upgrading the current system of the DC machines laboratory to make it more accurate, precise, and user-friendly while also maximizing the time consumed and the lessons learned during experiments. Hence, the researchers conducted this research.

Statement of the Problem

It is evident that there exists a large space for improvement in DC motor laboratories. This ranges from improving the accuracy and precision of the adjustments made in input voltages and currents to simple quality of life improvements such as a faster process in borrowing laboratory equipment and submitting preliminary data sheets. This research aims to address the enhancements that can be performed to improve the overall laboratory experience of electrical engineering students in DC motor laboratories. This research also aims to answer the following questions:

- How accurate and precise are the data gathered by the students in DC motor laboratories?
- How effective are the laboratory manuals in familiarizing and encouraging intractability with students in DC motor laboratories?
- Are there any system protection and abnormality detection programs that will protect the operator and the machine in DC motor laboratories?
- What possible implementations can be introduced in order to reduce the time consumed in borrowing laboratory equipment and submitting, checking, and grading preliminary data sheets?

Objectives of the Study

The general objective of this study is to improve the overall laboratory experience of electrical engineering students by revolutionizing the traditional way of conducting laboratory experiments using a computer-based DC machines facilitation program that will control and monitor the basic parameters of DC motors. The specific objectives of this study are enumerated as:

- To improve accuracy and precision by providing a function that allows fine tuning of the DC motor parameters
- To aid in familiarizing students in the operation of DC motors by presenting a more user-friendly interface
- To reduce the risks and promote safety by integrating an automatic system protection and abnormality detection program

- To maximize connectivity by implementing a web-based laboratory equipment borrowing system and preliminary data sheet grading system

Significance of the Study

The necessity of the study lies in the idea of providing an improved process of conducting experiments in the DC machines laboratory which encompasses a more accurate and precise acquisition of data, a more user-friendly interface, a safer practice in the workplace, and a faster and more convenient equipment borrowing and result checking.

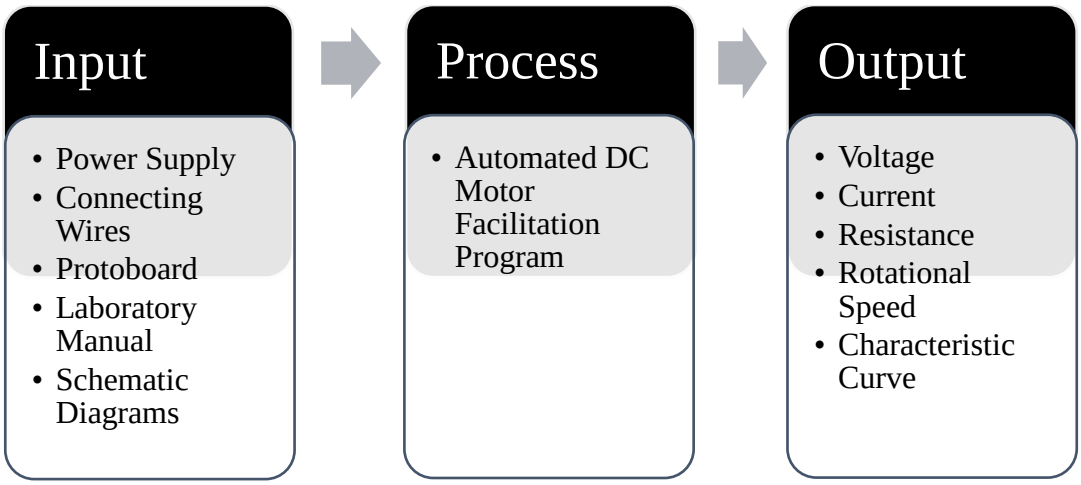
Scope and Delimitations

This study is conducted in order to improve the overall laboratory experience inside the DC machines laboratory of Malayan Colleges Laguna during the school year 2019 – 2020. The aspects that are considered are the voltage, current, and resistance parameters, the rotational speed, and the characteristic curves of DC motors.

Limitations

The limitations of this study include the availability of computer units that can be used by the students and the working condition of the DC motors inside the laboratory.

Conceptual Framework



The researchers will utilize a protoboard, power supply, and connecting wires to program the Lab-Volt Electromechanical Training Systems (EMS) Module and control the parameters supplied to the DC motor. Using the laboratory manual and the schematic diagrams as a guide to connect the circuit correctly, the automated DC motor facilitation program will monitor all the required readings in the laboratory manual. These readings involve the voltage, current, and resistance parameters, the rotational speed, and the characteristic curve of the motor.