

Project based Learning: Some Illustrations for Electrical Engineering Students'

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Abstract—Building a project is a most important aspect of engineering education. Project Based Learning (PBL) is not only much effective but also it gives a lot of other skills to students and it is found to be more engaging and appealing for students. PBL is exciting as well as most important part of learning for engineering students. These projects are either part of syllabus or some time students make it for learning, participating in competitions, their own interest in a particular topic etc. It is seen that most of such projects are not used in any application after its development which results in loss of efforts, time and money.

This work proposes that the main focus of such projects should be on application. With some examples, it is suggested that the projects can also be made to solve some day to day problems existing in the system or improvement of some of the systems of the college so that the college or students can be benefited. It will also encourage the student who has made it along with other students.

Keywords—college, engineering, students, project, application

I. INTRODUCTION

Today the traditional skills of reading, listening and writing are necessary but not sufficient for young students to survive in the real-world [1]. Project-based learning is an instructional approach designed to give students the opportunity to develop knowledge and skills through engaging projects set around challenges and problems they may face in the real world.

Project-based learning, or PBL, is more than just projects. As the Buck Institute for Education (BIE) explains, with PBL students "investigate and respond to an authentic, engaging, and complex problem, or challenge" with deep and sustained attention. ArchForKids LLC put it even more succinctly: PBL is "learning by doing" [2].

In Gold Standard PBL, Essential Project Design Elements include: Key Knowledge, Understanding, and Success Skills - The project is focused on student learning goals, including standards-based content and skills such as critical thinking/problem solving, collaboration, and self-management. According to the BIE, the key elements to project design include:

- A Challenging Problem or Question
- Sustained Inquiry
- Authenticity
- Student Voice and Choice
- Reflection
- Critique and Revision
- Public Product

All these elements, if combined well, result in students learning key knowledge, understanding, and skills for success.

Several benefits of PBL are listed below:

- connects students to the real world
- improves student attitudes toward education
- keep students engaged
- helps students develop teamwork and problem-solving skills
- focuses on long-term retention instead of short-term memorization strategies

In this work, some illustration are given for the benefit of Electrical Engineering students based on PBL. These illustrations are easy and linked with the course of B.Tech. Electrical Engineering.

II. SOME ILLUSTRATIONS

A. *Electricity Saving in the Campus/ Homes*

Now a days, electricity bill is a major part of total expenses of any residential, commercial and institutional buildings. In educational buildings, cost of electricity is increasing day by day as the use of gadgets in colleges are increasing and the facilities like air-conditioning and sports in night etc. are also increasing.

The cost of electricity in the campuses can be reduced by taking some measures and student projects can be one of them. Students can undertake study projects based on following ideas which can help him in understanding the various concepts of electricity saving and submit the study report to the concerning department:

- Impact of use of LED or low energy compact fluorescent lamps (CFLs).
- Study of building design and its layout for getting natural light (south facing orientation provides the maximum opportunity for solar gains in winter).
- Formation of energy club of students at various levels ie in hostels and in college: Should encourage students to be energy efficient in their living spaces by organizing awareness camp in hostel and college.
- To make a significant difference just don't conserve electricity but start generating electricity in the college by encouraging generation by solar energy.
- The students shall study about the connected load, load curve and consumption of electricity in their homes and find ways and means for reducing it.
- The door lock of each hostel room can be replaced by smart card from of normal lock.

B. *MATLAB, LabVIEW and other software based laboratory experiments*

Engineering education focuses on application involving experiments and measurements than a theoretical one. Educational practices that over-emphasize theory alone are outdated, as it is important for students to not only gain knowledge about engineering but also to implement it. In order to achieve this MATLAB, LabVIEW and other software based laboratory can be set up for conducting experiments related to various subjects. Most of the lab experiments can be performed on MATLAB, LabVIEW and other software which will be helpful in the following ways:

- Ease of accessibility
- Flexible timing

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- Changes can be done as required
- No need of hardware, only software is required
- Fully protective

A lot of experiments which are done in practical labs can be done using software. The teaching material related to such experiments are available in abundance on web. Some of the examples for the students of electrical engineering are given below:

1. Name of lab: Power Electronics Lab

Name of experiment: Full wave controlled rectifier circuit as shown in figure 2.1.

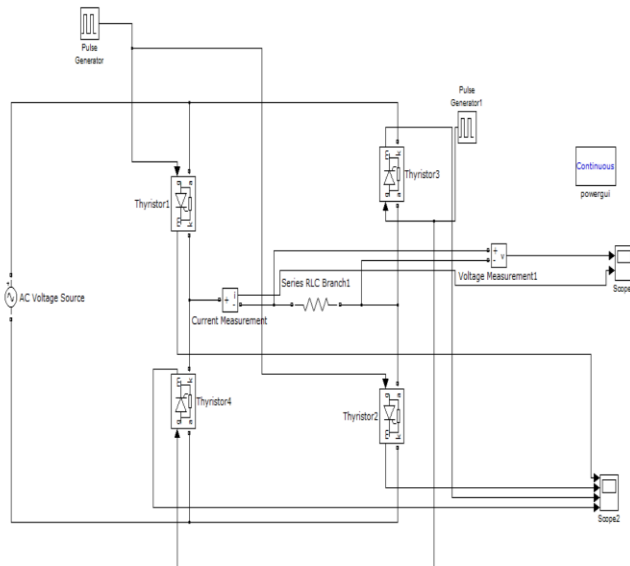


Fig. 2.1: Simulink model of Full wave controlled rectifier circuit

2. Name of lab: Measurement Lab

Name of experiment: Measurement of voltage across various elements as shown in figure 2.2.

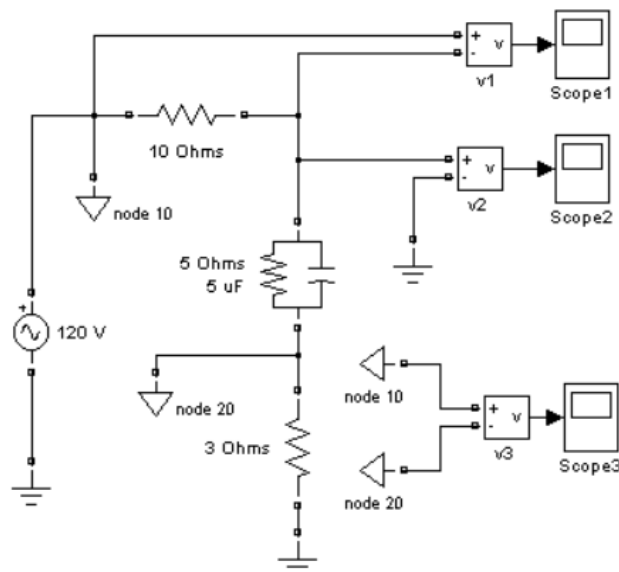


Fig. 2.2: Simulink model of showing measurement of voltage

3. Name of lab: Machine Lab

Name of experiment: Starting a DC Motor as shown in figure 2.3.

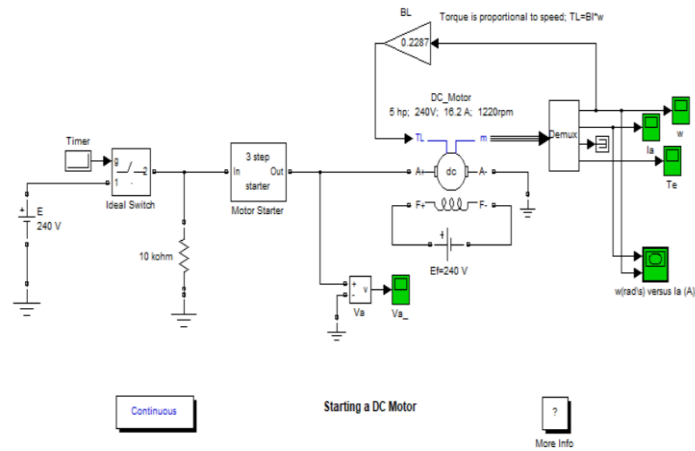


Fig. 2.3: Simulink model of starting a DC motor

4. Name of lab: Power systems lab

Name of experiment: [3] Simulation Power System in Matlab/Simulink as shown in figure 2.4.

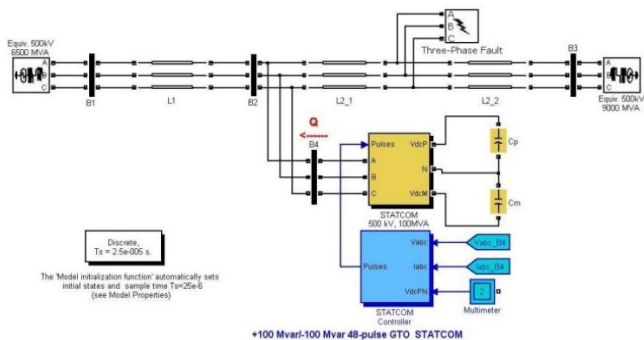


Fig. 2.4: Power system simulation

5. Name of lab: Electric vehicle

Name of experiment: [4] Designing electric motor model using Simulink as shown in figure 2.5.

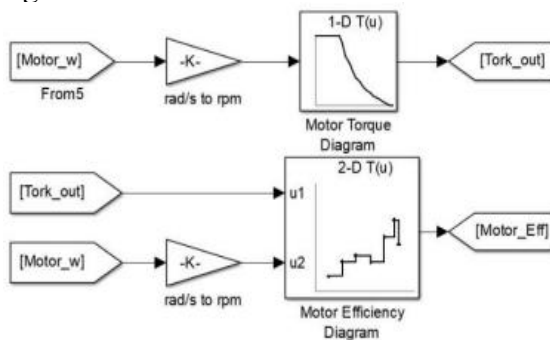


Fig. 2.5: Electric Motor Model with Simulink

6. Name of lab: Control systems lab
 Name of experiment: [5] Simulink of an PID model for the first order system as shown in figure 2.6

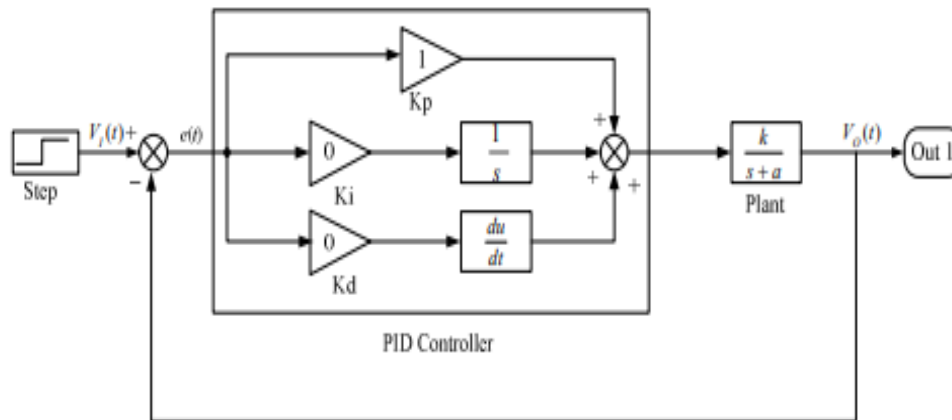


Fig. 2.6: PID model for the first order system

7. Apart from the above a lot of simulation/ GUI examples are available in research papers like MATLAB based Image processing lab experiments [2].

C. Developing various platforms for Improving Communication Skill of Students

- Offering group presentations and assignments helps in improving both oral and written communication skills.
- Through critical thinking exercises: - It gives students a chance to answer creatively using their own words and expressions. Educational games also help students to think critically and improve communication skills.
- Students must be given teaching opportunities.
- Recording students reading selected text or videotaping group presentations is a great method for assessing their communication strengths and weakness.
- Teach active listening to your students: It can be achieved by listening to a section of materials (via audio book, television, or another student can read aloud)
- One has to over communicate to communicate.

D. Making projects to solve various problems using programming, mobile app., IOT, Robotics, AI etc. Few example are given below:

1. for example making a project on Mess Wastage Control based on Real Time Food Requirement Calculation using a phone application.

The following flow chart can be developed into a solution using programming/ mobile app.:

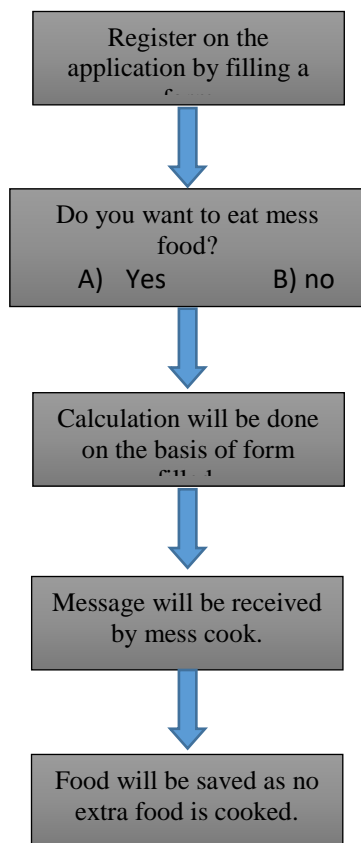


Fig. 2.7: Flowchart for application development

2. Digital library for students notes

All the notes prepared by students can be uploaded on Google drive. Students may have the access to Google drive for not only reading notes but also for uploading other notes. It can be made available anywhere be it phone, laptop, desktop computer, etc.

III. CONCLUSION

In this work, some illustrations are developed pertaining to Project Based Learning (PBL) for the students of B.Tech. Electrical Engineering. It is proposed that the students should undertake PBL as it is very effective for learning and by using PBL approach students are prepared for the challenges in real word, mirroring what professionals do every day.

This approach will enhance the ability of students to face real life challenges and empower them with skills which are required for becoming a successful professional.

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