Expanding Laboratory Experiences in Circuits and Networks

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GIFTS: Expanding Laboratory Experiences in Circuits and Networks

Introduction

The Electrical Engineering Program at Western Kentucky University has a commitment to project-based learning [1,2]. A part of this commitment is to provide strong laboratory experiences throughout the entire curriculum. Efforts must be continually made to widen our curriculum and labs to better prepare students for life-long learning. Our idea was to split a one-hour lab between two courses to get a better result. Several labs were modified to be a nonstandard 1/2-hour credits and additional labs were added to the curriculum. In particular, the two course circuits sequence is discussed in this paper.

Curriculum Modifications

Curriculum development requires the ability to balance the desire to maximize learning with a limited number of credit hours. Western faces an additional challenge of expanding our curriculum while Kentucky's Council for Postsecondary Education is pushing for a decrease in the number of credit hours required to earn a bachelor's degree.

Western offers a two course seven (7) hour sequence in circuits and networks. Previously the two-course circuit sequence consisted of two three credit hour lectures with a 1-hour lab offered with the initial course. It was determined through the assessment process that the students would benefit from having lab experiences with both circuit courses. To increase lab experience without adding additional hours to the curriculum the lab was split into two 0.5 experiences. One lab with each class.

Results and Discussion

Splitting the labs resulted in a couple of immediate benefits for our students. The total number of circuit labs was increased from 10 to 12 labs. In addition, labs were better coordinated with topics presented in lectures. Previously early semester labs were difficult due to limited lecture time. Having the ability to start labs later in the semester removed this limitation. In addition, the open weeks could be used for optional problem and review sessions.

Table 1. Lab Experiments in Two Course Circuit Sequence.

Circuits I	Circuits II
MultiSim	MutliSim
KVL, KCL, Ohm's Law and Power	First Order Circuits
Shorts and Opens	Second Order Circuits
Superposition	Passive Filters
Thevenin Norton	Active Filters
AC Steady State	Two Port Networks

Students benefited from having a hands-on experience in both circuit courses. Coordination of topics with labs was also beneficial for students. In addition, students enjoyed having hands-on experiences coordinated with concepts presented in the second course. A new circuits sequence was developed, and the new lab sequence is shown in Table 1.

References

[1] Lenoir, Joel, and J. Russell. "The Roles of the Student in a Project-Based Engineering Curriculum." *Proceedings of the International Conference on Practice-Oriented Education: Transforming Higher Education, Northeastern University, Boston, MA*. 2001.

[2] J.W. Pardos, "Engineering Eduction in the United States: Past, Present, and Future", *Proceedings of the International Conference on Engineering Eduction*, Rio de Janeiro, Brazil, August 1998.