

CCLI EMD 0088904

Educational Materials for Effective Practices in Engineering Service Courses

A typical undergraduate service course in electrical systems offered to non-ECE students is a survey course with no laboratory component, broad coverage, and a startling lack of depth. These courses are most often not integrated into the students' major discipline. Knowledge and techniques gained in previous core courses are not reinforced and built upon, and the students are not prepared for subsequent core courses in their major. The result is that students are bored, faculty are frustrated, and the learning outcomes are very poor. At a time where many engineering systems have an integral electrical component, there is a pressing national need that these courses be improved.

The goal of this EMD pilot project is to improve the student learning outcomes for the electrical systems courses offered to mechanical engineering students. Content for the course, developed by the PIs in collaboration with mechanical engineering faculty at Rose-Hulman Institute of Technology, is 40% power and machines, 40% transducers and measurement, and 20% controls. These topics are offered to mechanical engineering students in the context of mechanical engineering. The redesigned course uses and applies materials from their sophomore core courses and helps prepare students for their mechanical engineering measurements class. The redesigned course is listed as prerequisite for the ME measurements course. Faculty teaching the measurement class are in the process of augmenting and enhancing this measurements course due to the enhanced preparation of the students entering the course.

As part of the NSF project, a studio classroom environment has been designed to allow a blend of lecture and laboratory work in each 2-hour class period. The students work with signal conditioning systems, measurement systems, electrical machines, power, and controls. These topics are readily related to mechanical engineering and are presented in the context of mechanical engineering so that ME students can readily see how they connect to their discipline.

In the latest offering of the redesigned course, 89% of the students say the COURSE and their LEARNING EXPERIENCE are either very good or excellent. This compares to 48% for the COURSE and 54% for LEARNING in the course prior to the NSF-supported project. Below are a few student quotes from focus groups:

"This was the first class I have had like this...I've gotten more out of the labs in this class than I have in any other class here..."

"The labs also address much more specific things because there's so many of them."

“Instead of just having us write down the data, you actually had to think about it and analyze why it happened like it did.”