Enhancing Undergraduate Engineering Laboratory Experience

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ABSTRACT

The importance of experimental activities is being increasingly recognized as integral elements of engineering curricula today. A reflection of this trend is evidenced by the review criteria applied by educational accreditation boards such as ABET. The crucial role that laboratory experiments play in providing a meaningful engineering experience to the undergraduate students, cannot be over emphasized. This paper discusses the technical approach taken and the experiences gained at ASU in two of the engineering courses – one in Mechanical and the other in Civil Engineering concentration areas. Specifically, these two courses emphasize learning through a series of hands-on laboratory experiments, which provide knowledge and better understanding of the theory that has been discussed in lectures. One of the goals is to provide the students with experience in designing and implementing laboratory experiments, given specific objectives as well as constraints. The development of the experiments and associated laboratory equipment for teaching these courses will be presented. All experiments are carried out in specifically designed experimental stations, which are equipped with the requisite hardware and software. The students, working in groups, are exposed to a variety of instrumentation, software and systems, including sensors and PC-based data acquisition. The experiments are designed to integrate the material covered in the lectures, as well as provide students the opportunity to further research the details required to successfully carry out the experiments. The design and technical implementation of the experimental setups will be summarized. It is believed that enhancements in the laboratory experiments, has led to improved students' performance in the courses, as well as their ability to design and conduct experiments. The role such laboratory exercises can play in enhancing undergraduate engineering curricula is discussed. The impact of the ABET accreditation process will also be illustrated.