

Introducing Undergraduate Students to Practical Radio Frequency Techniques and Measurement

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Hands-on experience provided through well-developed laboratories gives students skills necessary to complete and succeed in their career. Knowledge gained through doing things has much longer retention span than understanding gained through modalities such as class lectures. Hands-on laboratories can help students gain much better understanding of Radio Frequency (RF) topics that involve complex concepts. Developing new RF laboratories is capital and time intensive, and realization of such labs for smaller institutions with limited resources can be challenging. This paper will present development of cost-effective RF and software-defined radio-based RF laboratories for undergraduate Electrical Engineering students. Low-cost RF-kits and software-defined radio-kits from commercial vendors were obtained and 13 laboratory sessions on topics: RF/Microwave Concepts, Transmission Line, Impedance Matching, Antennas, Propagation, Transceivers, Filters, Amplifiers, Oscillators, Mixers, and Software-Defined Radio have been developed and delivered in 2017 and 2018. The details of the hardware kits, developed laboratories, implementation and assessment methods, and assessment results, including students' feedback and responses, will be presented and discussed. Students from the two semesters taught to date have commented how the classes helped them in obtaining suitable jobs upon graduation. We conclude this work by presenting comments from recent engineering graduates addressing how the course helped them to find full-time employment."