Mobile Modules for Multidisciplinary STEM Education

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***Abstract*—Traditional STEM education models in electrical engineering and computer science rely on structured classes, laboratories, and text-books to transfer key concepts. While this process meets several ABET objectives, it does not address well, the current workforce needs that require widely accessible programs that will provide a large pool of graduates with STEM backgrounds, analytical and programming skills, critical thinking, and leadership abilities. Here, we describe our efforts to motivate students to pursue studies in STEM areas. We accomplish this by creating and disseminating modules that demonstrate how math and engineering theory enable modern applications such as those embedded in wireless devices, including GPS and MP3.**

I. Project Summary

Traditional STEM education models in electrical engineering and computer science rely on structured classes, laboratories, and text-books to transfer key concepts. Even though this process meets most of the ABET objectives, it does not respond well to current workforce needs that require widely accessible programs that will provide a large pool of graduates with STEM backgrounds, analytical and programming skills, critical thinking, and leadership abilities.

In this paper, we describe our efforts to motivate students to pursue studies in STEM areas. We accomplish this by creating and disseminating modules that demonstrate how math and engineering theory enables modern applications such as sensor signal processing [1] and those embedded in wireless devices. These modules will include demonstrations, lecture and lab content and will enable and motivate undergraduate students to learn STEM topics by understanding their utility in modern applications. Lab exercises will promote algorithm understanding and provide programming skills for high-tech workforce creation. Implementation and dissemination on mobile platforms can help create a community of diverse users through content that can be used in universities, community colleges and high schools. These modules will be immersed in several courses in engineering and other fields such as arts and media as well as health monitoring.

As an example, applications of Fourier spectra to wireless sensors, as utilized in radar and health monitoring, can be used to generate STEM computing modules for Engineering and non-Engineering classes, which are used in undergraduate courses and will provide STEM application experiences to students. Modules will cover various aspects of engineering, including: a) software implementation on mobile platforms [2], b) computational complexity and other implementation issues, and c) software for multiple platforms including Java, MATLAB, and Android [3]. Multidisciplinary materials will also be developed and several aspects of these studies will be used in Arts and Media [4], Informatics, and Geology [5] classes of partner universities. All modules are being tested and assessed in our DSP and signals and systems classes.

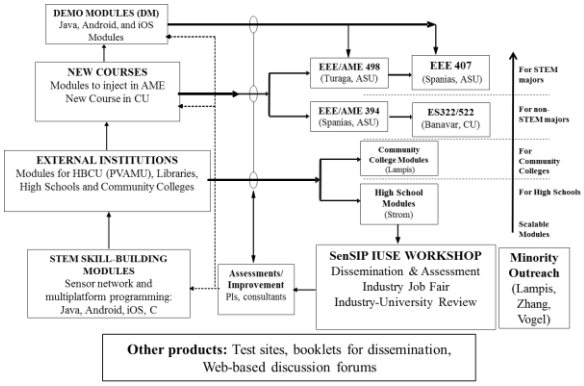

Figure 1. Module creation, deployment, and assessment.

Previous outreach activities have included demonstrations at CDS High School and Phoenix College [6]. Collaboration and disseminations also include activities with University of New Mexico, Prairie View A&M University, University of Cyprus, Tecnológico de Monterrey (ITESM), Imperial College, and John Hopkins University. Additional relevant work has been published in [6-8].

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