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Paper

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First-Year Design as a Gateway for Innovation in Engineering Curriculum

In the last decade the National Science Foundation (NSF) and the engineering colleges in United States have paid great attention to the first-year engineering design courses as a way of increasing student retention and motivation to pursue engineering. As a result, most of the engineering colleges in USA have revised their curriculum in one way or other. Some of these changes are small and others are significant with dramatic changes in student motivation and student learning. Introducing changes in the first-year is also often looked at as a way of sparking change through out the undergraduate curriculum.

This paper looks at an evolving first-design curriculum developed at Penn State University in collaboration with six other leading institutions in USA , which was funded by NSF under the project named ECSEL (Engineering Coalition of Schools for Excellence in Education and Leadership). The program evolved from converting typical graphics course, introduction to engineering disciplines, engineering ethics, or other similar first-year courses to an industry sponsored, project oriented, hand-on, team oriented design course with international collaboration. These changes have evolved over a period of ten years demonstrating increase in student learning, student motivation, industry participation, and exceptionally high faculty rating. The course is offered to 1800 students per year in the Penn State University system, and a similar course is offered to 1500 students within the ECSEL coalition schools. The international collaboration for this course involves Penn State students working on collaborative projects with Université d`Artois in France and University of Leeds in UK. In fact, the course material has become an integral part of outreach activity in the College of Engineering at Penn State University, and recently, the some of the course material has been adapted for outreach activity in University of Durban-Westville, in South Africa.

This paper establishes the premise for developing a first-year engineering design course, strategies for designing and delivering the content, and the infrastructure needed to sustain continuous growth. The paper also documents the assessment techniques used to determine the student learning and various skill developments.