

BSE Design  
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We have made several important changes to the design content in the Biological Systems Engineering curriculum because of this project. When this project started, I was teaching the senior design and had done so for over 10 years. Since I had been involved with ABET for many years as a program evaluator (over 20 visits and made my last visit October 2000) and member of the EAC serving as chair of 14 accreditation teams, I was aware of the ABET requirements. I had already had the students working in teams. The comprehensive senior engineering design experience consisted of one a 1-hour course offered in the Fall semester and a 3-hour course offered in the Spring semester.

My concern about the former senior engineering design experiences was that some faculty felt that I had the total responsibility for teaching engineering design and did not emphasize design in their courses throughout the curriculum.

**As a result of this project**, I have been able to identify desired changes and made some of these needed changes. While continuing to teach the senior design course, I was successful in getting several students, other than BSE, enrolled in the course and participate in the senior team design projects. This certainly has not been as successful as I wanted it to be since I only had three such students in two years. I was able to generate "real world" design problems and also had several **international** design problems (one was a design of a solar-powered irrigation system for a developing country and another one was the design of a shrimp production system in Mauritius at the time one of our faculty member was there on a Fullbright). I did have the two design course sequence changed from a one and three hour to two 2-hour courses so that more material and design can be included in the Fall semester course and give the students more continuity in the design experience. However, I did not solve the lack of design throughout the curriculum problem initially.

Two years ago I requested assignment to teach the sophomore introductory courses for the BSE majors. I was given this assignment and am teaching the 2-course sequence for the second time. The sophomore courses are two two-hour courses. These courses initially were designed to introduce the BSE student to the opportunities in the BSE area and to cover the use of software to solve engineering problems. **As a result of this project**, I changed the sophomore courses to include more design and am making suggestions for faculty to include more design in their courses. The current sophomore courses now include a 2-semester design project in which they must design, build, and test a machine, system, or device while working in teams. The design last year was a residential composter. During the year, I had three teams of four students each who designed, constructed, and tested their composters. This year the year design assignment is a food dehydrator designed to meet the needs of a family of five or a community of 20 in some developing country (to be identified and justified by the team) using locally available materials and costing no more than \$300.

In addition to the 2-semester design project and **as a result of this project**, I have introduced several smaller design projects in which the students design and build the designed items. This semester, I have also has the students, working in teams, design a

the test procedure to determine the coefficient for an orifice that will be used in a later laboratory in which they will observe the flow through an orifice for a system having a falling head and a constant head system. They developed the test procedure during the last class period and will conduct the tests during the next class period.

I have also developed small design projects in which the students can design and construct simple devices that can be completed in one or two class periods. It is my intention to supply faculty members the written procedures to provide these experiences in their courses. It is hoped that faculty will include these activities in their courses if much of the work is done for them. In this manner, we can include design experiences throughout the curriculum. If we are successful in including design throughout the Sophomore and junior courses, the students will be more aware of the design procedures by the time they are seniors and will then have much more rewarding experiences in their senior design courses.

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- Developed two-semester sequence sophomore design courses
- Include team experiences now at sophomore level (already had it at senior level)
- Require sophomore students to design, build, and test machines – small-scale designs and a two-semester design project, all working in teams
- Developed small design projects (one to two class periods) to be included in other sophomore and junior Biological Systems Engineering courses
- Internationalized design projects for both the senior and sophomore design courses
- Include students from both the Land and Water option and Bioprocessing option on the same design teams to gain some multidisciplinary experiences. Include non-engineering students on senior design teams. Have not been successful in including students from other disciplines but are working on it
- Have sophomore students participate on senior design teams - primarily developing and maintaining a Gantt chart for the design project using Microsoft Project
- Developed “real world” engineering design problems for the senior comprehensive design courses
- Strengthened the design experiences throughout the BSE curriculum by introducing and practicing the engineering design procedures at the sophomore level