

## **Improving Engineering Technology Programs through University/Industry Partnerships**

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### **Abstract**

Engineering Technology programs can be greatly improved by building strong partnerships with industry. Industry partnerships are an important key element that leads to program excellence for technology-related academic programs. This type of proposition is a win-win situation for industry and university as it will greatly enhance student learning and both university and industry will benefit from this relationship. Industry can contribute toward the academic program improvement by providing regular input in terms of industry expectations of graduates, and also through active participation of the industrial advisory committee (IAC). Partnerships are initiated by a “memorandum of understanding” agreement between the university and industry. Industry-university partnerships can serve as a vehicle that helps with the continuous improvement of that particular academic program. An example of this partnership is the forming of an industry advisory committee between the department and industry. The industry advisory committee (IAC) shall comprise of members of various companies who are interested in the growth and future of the engineering technology program, students, faculty, and administration of the engineering technology department and college.

This paper will describe three initiatives by which industry partners are helping improve the Electronics Engineering Technology program at Southern University, Baton Rouge, Louisiana. 1) Industry is involved in curriculum development of the engineering technology program. 2) Industry involvement on senior capstone design projects gives the student real world experience and skills. 3) Employment of faculty and students as interns in industry will enhance industry experience and will give them cutting edge technology.

### **Introduction**

The primary goal of an engineering technology program is the preparation of technically competent entry level engineers for private industry. The Industry –University partnership is an important element that leads program excellence for technology related academic programs. The applied nature of technology programs makes it necessary to develop a mutually beneficial partnership between industry and academic programs. The programs benefit through understanding of the contemporary issues of industry and thus develop relevant curricula that meet industry need. Industry-University partnerships is one of the vehicles that help with continuous improvement of the program. An industry can contribute toward academic program

improvement by providing regular input in terms of industry expectations of graduates, and also through active participation on the industrial advisory committee (IAC). [1]

Incorporating quality in engineering technology education is a key factor in the success of educating engineering and technologists for the new era. A quality emphasis in technical education is closely linked to participation from industry. Some of the ways in which participation of industry would increase the quality in education is by teaching classes, providing internships, providing summer employment for both students and faculty, being an education advocate, serving on an advisory committee, and partnering with an engineering technology school.[2].

In addition to presentations on theory, industrial experience should be included in the classroom. The student needs to make the connection between industry and theory early to obtain a good understanding of the basic engineering principles. Bringing industrial experience to the classroom will enhance the student's understanding of theory.[3]

### **Need for Curriculum Reform with Industry**

Research strongly supports the fact that the best engineering technology curricula have partnered with industry. Industry –university partnerships enable a program to maintain dynamic curricula and to integrate real-world experiences into the classroom and laboratory.[4]

The practice of engineering and engineering technology is undergoing significant changes due to the progress of technology, and the changes of business practice the world over. The complaint is that engineering and engineering technology curricula have not kept up with the changes and, as a result, are turning out student ill prepared for work in today's technology workplace.

A recent survey done with the intent of gaining insight on how to reform engineering education, found that the majority of new graduates felt that there was considerable knowledge required by their jobs that was not part of their undergraduate education. The consensus was that curricula in general fell short of stressing creative thinking and problem solving skills, as well as other analytical and interpersonal skills. The result of these facts are that industry has inherited the considerable cost of additional training to give new hires the skills they need to be productive.[5]

### **Benefits of an Industry Advisory Committee (IAC)**

Many university programs are now beginning to discover that an industry advisory board or committee can serve as a valuable complement to the program leadership team. In fact, the proliferation of advisory boards (committees) is helping university programs develop specific plans with clear and effective strategies in order to deliver a quality education.[6].

The industrial advisory committee helps the department accomplish its goal of meeting the commitments of the department mission and vision. This includes the following.[1]

- Advise on issues related to the learning, discovery, and engagement mission of the department. Review the course curricula and provide feedback to the department on

overall subject matter relevancy in today's workplace environment to ensure that scholarship teachings keep pace with business and technological evolutions.

- Develop resources in the form of scholarships, endowments, and gifts-in-kind for student and faculty.
- Provide opportunities for internships and co-op positions for our students and provide employment opportunities for our graduates.

### **Southern University Electronics Engineering Technology- Industry Partnership.**

The Electronics Engineering Technology (EET) department at Southern University has teamed with local area industries (Entergy and Exxon) and two other companies (Lockheed Martin-Dallas, Texas and Raytheon- California) to form academic partnerships. All four industries serve on the Industrial Advisory Committee (IAC) for the Electronics Engineering Technology department. The IAC has helped to revise our EET curriculum with courses that would better prepare our graduates for industry. One new course that was developed with industry input was our new Programmable Logic Controller (PLC) course. In addition, the college has an adopt-a-lab program with industry to support a laboratory by giving a grant to buy new equipment or maintenance of existing equipment. In return, the department will put a nameplate indicating that this company has sponsored that particular laboratory. In the Spring semester of 2005, Entergy Corporation gave a grant to sponsor the EET power and PLC lab in the amount of five thousand dollars. [7]

Our industry partners have also provided grants to the College of Engineering for support of our Engineering Summer Institute (ESI) program. This program helps to attract high school students (9-12<sup>th</sup>) to our campus each summer. In this program, high school students are taught about the engineering profession, engineering design projects, academic skills enhancement, ACT test preparation, math, and field trips to engineering companies to reinforce engineering concepts. The ESI program is also used to recruit high school graduates into the college of engineering. The industry partners also give money for scholarships for engineering freshmen and upper-class students to help alleviate tuition costs. In addition, industry partners offer co-op and summer internships to the engineering and engineering technology students to give them real world experience they would not ordinarily get in their own department laboratory. Lockheed-Martin in Dallas, Texas has made job offers to nine of our engineering technology graduates.

In order for students to be familiar with working on a design project before the senior capstone design course, design projects are integrated into the curriculum early on. This was one of the recommendations from our industry advisory committee (IAC) members. These projects should increase in complexity from the basic electronics courses up to the senior level design course. We do this in order for the beginning student to start having some familiarity with working on simple design projects in their capstone courses.

### **Senior Design Capstone Projects**

The second area of interest that will influence a student's potential and give them marketable skills in industry is the senior design capstone project. The design capstone project course is a two semester course at Southern University and is taken by the student in their senior year. A partial list of senior design projects students have designed and built in this course included:

1. The Robotic Arm
2. An Interactive Traffic Control System
3. HVAC AC Damper control circuit
4. A Control system for a three blade windshield wiper.
5. Digital timed air freshener
6. 3 Station Wired Point-to-Point Communication System

Industry is involved in our senior design capstone project course. To get industry involved, we ask our industry partners to come up with several ideas for possible senior projects and sponsorship of that project. In the first semester, the proposal stage, the students select a team and project idea from a faculty advisor, research journal or industry sponsored project. Industry is also asked to help in project evaluation during finals week. Project evaluation forms are used by faculty and industry representatives to grade project presentations and give feedback of the projects during oral presentations. These evaluations are used in calculating final grades of students on their project. Entergy, Inc. and Exxon have provided representatives the last two years to help evaluate projects. In addition, industry is also asked for support in terms of mentoring/advising of a student group working on these projects during the course of the semester. Financial support is also sought for funding of equipment and materials to build these student projects.

An industry sponsored senior project will provide students a practical real world project, and hands-on experience that greatly enhances the technical, theoretical, design and analytical education provided in the classroom. Working on projects cooperatively gives the student good communication, interpersonal, and teamwork skills necessary for today's work environment. At the present time, ENTERGY Inc. has agreed to sponsor a project for a student group in the Fall 2006 senior design capstone course.

The benefits of a company sponsored capstone design project, both to academia and to industry, have been well established. The benefits to students include the broadening of their engineering skills, the required interaction with practicing engineers, the strengthening of teaming skills by working in design groups, the development of communication skills with required oral and written reports, and the experiences of project management.[8]

### **Faculty-Student Internships with Industry**

Faculty internships are an effective way for educators to gain practical experience they need or maintain currency in knowledge and skills. There are several benefits for faculty internships, including: Professional development of the faculty, enhancing the public image of the university, enhancing the teaching ability of faculty, and providing a source of highly skilled and educated individuals for use by the profession. The main benefit that industry gains is having access to highly educated faculty that can help solve important industrial problems. Some other

benefits include industrial access to university facilities and information about emerging technologies from cutting edge research. Industrial partners usually would like to improve their relationship with local institutions and also improve their standing in the community at the same time.[9]

Students also need internships with industry to make the correlation between theory and practice in their various engineering disciplines. Industrial projects provide the student with motivation and realism. Interdisciplinary teams and projects provide the students with a much more realistic picture of the type of work they will do once they graduate. A benefit for the student intern is networking with other students across the country and forming friendships for life. In addition, students will gain experience using equipment for research that their department may not have, giving them some expertise in using that equipment. Working in industry, the student gains confidence in engineering design and working on solutions to engineering problems.

## **Conclusions**

Academic-industry partnerships are definitely improving the Electronics Engineering Technology program at Southern University (Baton Rouge, Louisiana). This paper has investigated three areas of interest where industry and the EET department are working together as partners to improve the electronics engineering technology program at Southern University. The industry advisory committee (IAC) works with engineering technology department to reform curricula to better prepare engineering technology students to compete in the marketplace once they graduate. Industry can mentor students and/or provide funding for senior project, in addition, provide a sponsored project the students can work on. The third area of interest is industry providing employment to faculty and students as summer interns and co-ops giving them job skills and cutting edge technology that will be beneficial to the student and university.

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## **Biography**

WALTER O. CRAIG, III is Assistant Professor of Electronics Engineering Technology at Southern University, Baton Rouge, Louisiana. He earned his B.S. (Physics, Southern University, 1972), M.A. (Physics, University of Texas, Austin, Texas, 1975), and Master of Material Science and Engineering (North Carolina State University, 1993). Professor Craig's specialty is in the area of processing of solid state devices and electronic materials.