2006-1054: OFFERING AN INTERNATIONAL DEGREE PROGRAM AS A DUAL DEGREE WITH LIBERAL ARTS

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Introduction

The need for internationalizing engineering education is an important topic for engineering educators. This is not a new issue, the National Academy of Engineering issued a report 18 years ago calling for greater international opportunities for U.S. engineering students[1]. Qamhiyah[2] cites two reasons for the continued importance for an international experience in engineering education: 1) the increasing trend for engineering firms to be transnational, and 2) the growth in the number of jobs being outsourced overseas. If engineers are going to be successful in an increasingly global profession, they must be prepared to work for multinational engineering firms and on teams of engineers that can be located anywhere on the globe. For engineering educators, one of the goals must be to design and implement opportunities for our students to gain an international understanding during their undergraduate degree programs.

The are several approaches being taken to accomplishing this goal: 1) student exchange and study abroad programs, 2) distributed international engineering teams[3], 3) international internships, 4) joint degree programs between multiple universities, 5) joint language and engineering degrees[4] and 6) and engineering curricula designed specifically to address international issues[5,6]. This paper presents details of a program recently developed at Colorado State University that uses several of these approaches.

Degree Implementation

In 2003 Colorado State University started a new International Engineering and International Studies program. This new degree program is housed within the Engineering Science program –an interdisciplinary program that spans the College of Engineering. It is a five-year joint program comprising 156 credit hours with students earning both a BS degree in Engineering Science with a concentration in International Engineering and a BA in Liberal Arts.

As a requirement of the Liberal Arts degree, students are required to get a minor in a foreign language. In addition to the language minor, courses related to international topics are also taken. Table 1 lists the required liberal arts courses that are then supplemented with a series of electives from liberal arts. In addition to these courses there are several courses required for the general education requirements that all university graduates must satisfy.

Students have considerable flexibility when designing the engineering curriculum for this degree program. This program emphasizes broadness instead of specialization.

Students take courses from a list of technical elective courses provided by the traditional engineering departments along with completing the traditional core set of engineering science courses. During the senior year students take a two-course design sequence. This sequence can be taking from any of CSU's four traditional engineering departments (Chemical and Biological, Civil and Environmental, Electrical and Computer, or Mechanical). Typically, students choose their technical electives to correspond with their senior design sequence.

Study abroad experience, or internships abroad are another component to this degree. Students can choose between either option but are required to be abroad for a minimum of one semester. This component is similar to programs at other universities, e.g. University of Rhode Island[4]. Some type of experience overseas is desirable.

Strengths

One of the major strengths of this dual degree program is the students' ability to receive an excellent liberal arts education that not only includes foreign language but also includes culture, history, and other traditional liberal education topics. The importance of language skills has been pointed out by many educators[6-8]. In today's global economy, it is also important for people to develop a greater understanding of the many issues affecting the world beyond a technology-centric view[9]. Table 2 includes short descriptions of the required liberal arts courses chosen to develop students' international awareness.

This degree program also provides students with greater flexibility than is common to the traditional engineering disciplines. Because our Engineering Science program is fundamentally cross-disciplinary – a desirable approach for engineers working in a global economy[5], students in the international engineering program have the opportunity to take courses from several of the engineering departments. For example, if the student's interest is geared towards environmental topics, they can choose courses from chemical, civil, and mechanical engineering that deal with environmental issues –albeit from different perspectives.

Weaknesses

Although this degree program offers some unique advantages over other approaches, there are some corresponding disadvantages it shares with the more traditional approaches. For example, there is no formal mechanism to require, or even encourage, faculty engagement in this program. Having faculty with significant international experience serve as the adviser to the students could strengthen this program. The difficulty with this arrangement stems from the students not belonging to the faculty's home department. So credit for this type of activity is not valued appropriately by the faculty's home department. Ultimately, students learn as much from what faculty value as from the course content so the lack of faculty engagement can be a serious shortcoming for this and all such programs.

The engineering courses remain the traditional courses that are used for all the degree programs. So, even though the students can experience a nontraditional

curriculum through flexible course selection, the courses themselves are not designed with explicit international content.

Summary and Conclusions

Colorado State University's new degree concentration in International Engineering and International Studies is a five-year dual degree program offered jointly with the College of Liberal Arts. Students earn an ABET accredited engineering degree and a liberal arts degree that includes a minor in foreign language. This approach requires students to take three courses explicitly addressing global issues. Two of these courses are political science courses related to global politics while the third covers global economics. These courses results are intended to explicitly prepare graduates to work in the international engineering environment by supplementing language skills with cultural, political, and economic knowledge of the global environment. This program also incorporates international experiences such as internships and study abroad, similar to programs at other universities. Students have the choice between study abroad and internships.

Table 1: Liberal Arts Content for International Engineering

Course	Credits
First year	
Second Year Language I	3
Second Year	
Second Year Language II	3
Current World Problems	3
Third Year	
Global and Cultural Awareness	3
International Relations or Comparative Government and Politics	3
Foreign Language Minor	6
Electives	3
Fourth Year	
Comparative Economic Systems	3
Foreign Language Minor	6
Fifth Year	
Electives	9
Foreign Language Minor	3

Table 2: International-Focus Course Descriptions

Course name	Description
Current World Problems	Background and nature of international political events
International Relations	Basic concepts and approaches in international relations
Comparative Government and Politics	Major foreign political systems stressing cross-national comparison of political forces, parties, ideologies, and institutions
Comparative Economic Systems	Place of the economy in different societies; nature and evolution of capitalism; crisis of command economies and capitalist restoration

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