Faculty Exchange, one aspect of International Co-operation in Engineering Education

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Abstract
This paper is an outcome of a faculty exchange program between an American and a German university, in the summer semester of 2001. The goal is to present and promote, the faculty exchange program as one of the many components of international cooperation in engineering education. After stressing the necessity and benefits of globalization of engineering education, the paper summarizes author’s own experience in organizing a faculty exchange program as one of many elements of international cooperation, as well as the obstacles and difficulties associated with it. While no single recipe for a successful approach can be provided, an attempt has been made to create a list of crucial guidelines. The objective is to encourage and share author’s experience with fellow educators. It is hoped that university international offices will be able to use findings from this paper as a tool to help faculty members in the development of faculty exchange programs.

Introduction
A recurring theme and frequent topic of discussion in education, business, and media, in the last decade has been global economy, and international competition. Most businesses, industrial and financial firms have had an international perspective. Many employers have been looking for some international knowledge in addition to technical skills in their future employees. As a consequence, engineering practice in many European countries is becoming more and more international. Engineering education throughout the world, especially in the developed countries, is beginning to have much in common, requiring more and more emphasis on globalization of engineering education. Engineering curricula are being redesigned to incorporate elements of international cooperation. Engineering educators in those countries are more knowledgeable in the international aspects of engineering education. They are more actively involved in the international co-operation activities, such as faculty and student exchange programs. This has not been quite true here in the United States. In the past, as studies have shown[1], United States educational systems have not delivered either the level or the nature of education required for success in a competitive global economy.

Globalization of Engineering Education is a necessity
In the past two decades international trade has expanded five percent per year. Today 22% of our GNP comes from international trade. Foreign business has become an increasingly critical element of America’s corporations. A substantial part of the United State’s corporate profits flow from abroad. More and more
firms, both large and small, are looking overseas for opportunities. No American firm can afford to assume that it is impervious to foreign competition. Failure to understand and adapt to the overseas environment is a cause of executive failure in international operations. To be successful a global perspective must be maintained at all times.

While the list of arguments supporting globalizations of engineering education is long, their common premise however, can be summarized as follows:

- There is an increasingly obvious need for business competing in a global economy to employ technical staff with an international perspective.
- In global industrialization, it is imperative that engineers and technologists have an international perspective. Most employers who plan on placing employees in international service prefer their employees have international knowledge in addition to their technical skills.

Engineering education for international practice

To adequately prepare new engineering graduates for careers in the international arena, it takes more than just adding a foreign language course to the existing curriculum. The minimum requirement must include:

- Foreign language proficiency, written and spoken fluency
- Understanding culture of peoples in regions of the world where graduates may practice
- Understanding of international business issues, such as competitiveness, free market development, multinational companies, varying ethical norms, and varying consumer protection mechanisms.
- Familiarity with measurement systems, varying standards and codes, environmental concerns

Participating institutions

Southern Polytechnic State University, an American University located in Marietta, Georgia. The mission of the university is to provide the residents of the state of Georgia with university-level education in technology, engineering, arts and sciences, architecture, management, and related fields. In Georgia, which is one of the fastest growing states, the realization that we are a part of “global economy” is very strong. Therefore, the mission of Southern Polytechnic State University (SPSU) is unambiguous about seeking international opportunities to participate in the teaching and transfer of technology. Both the faculty and administration are keenly aware of the importance of educating engineers able to practice internationally. SPSU has participated in foreign exchange activities for a number of years. The International Programs Office has worked with students and faculty members to establish international exchange programs.

Harz Fachhochschule (FH), a German University, located in Wernigerode, Germany.

Engineering education in Europe is a complex issue to deal with because of the very diverse engineering education systems within it. In Germany, there are two kinds of university:

- Classical universities offering a more scientifically/research oriented education.
Fachhochschulen (university of applied sciences) offering application oriented education.
The curricula of the Fachhochschulen have a bias towards a practical approach, whereas the classical universities have a more theoretical (research oriented) approach.
The degree from the Harz Fachhochschule is similar to an Engineering technology Bachelors degree offered in the US.
The Harz Fachhochschule serves students studying, automation, information technology and business. It features extensive teaching laboratories providing the students with a “hands-on” learning experience.

When and how did the agreement between the institutions begin?
A formal agreement of cooperation between the two universities has been in effect since 1994. Faculty and students from both institutions have visited each other universities on different occasions and for different academic purposes. This kind of cooperation, however, is the first of its kind between the two institutions and it began as follows. During the fall semester of 2000, initial contacts between two faculty members from Southern Polytechnic State University and Harz Fachhochschule were made. Several areas of interest for ongoing exchange activities in the area of Electrical and Computer Engineering technology were identified. Control systems seemed to be the most convenient area at the time, mainly due to the availability of volunteers to take part in the exchange. The author from SPSU and Dr. Steven Liu from Fachhochschule were selected as the first participants of Summer 2001 Faculty Exchange program. Most of the negotiations and communication were made via electronic mail. Both sides offered solutions for issues confronting them and made the following decisions with regard to the scope and implementation of the exchange.

1. The medium of teaching, will the courses be taught in English or German?
The medium of teaching for classes offered under Faculty Exchange program will be English. The obvious reason for this decision was the fact that the majority of students at Harz – Fachhochschule did speak and understood English. As a matter of fact, students enrolled in summer of 2001, in the class taught by the author, had asked for English to be the medium of teaching.

2. How will the students be tested and by whom?
Participating faculty will make the evaluation in accordance to the procedures and rules effective at host institution. It is important to remember that rules and procedures in Germany differ from what is generally applied in the US institutions. As an example, generally there are no quizzes; very often there is only one test (final exam) that can be either oral or written.

3. Who is responsible for housing and transportation?
Travel from US to Germany and from Germany to US by the participants would be expected. The time period from mid-May through August was required for this particular exchange to be completed. Housing was and remained a concern. The question of housing availability and cost in both countries seemed to be the biggest obstacle. It was clear from the outset that neither institution was in a
position to provide any assistance in housing arrangement. Initial discussions suggested that participants should arrange housing individually.

**Issues that need to be given more consideration in the future**

4. **Funding**
Funding for international initiatives is a significant issue for institutions in the US. It is important to note that housing and transportation is very expensive both in the US and Germany. Therefore, funding and the availability of limited resources remains a critical issue for American side. This is not the case for German institutions. In Germany extensive efforts are made by the government to make sure that universities have international standards and are closer to international system of education. Therefore, sufficient amount of funds and resources are at the disposal of university authorities for international activities.

5. **Communication**
In Germany phone calls are expensive, and language and time zone differences make the use of direct calls more difficult. Therefore attacking the communication issues early on is essential. Business letters from Germany are printed on paper that is longer than our 11-inch sheets which causes fax problems. It turned out that electronic mail provided significant help in reducing communication problems.

**References**
4.  GRUWALD N., Bachelor and Master’s courses in Germany, Proceedings, 1998 UICEE, Global Congress on Engineering Education

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