INTERNATIONALIZATION OF THE LAFAYETTE COLLEGE ENGINEERING CURRICULUM

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Abstract

Three key features serve to internationalize the Lafayette College undergraduate engineering curriculum.

> Semester-long study abroad opportunities for students in all Lafayette B.S. engineering degree programs.
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> A five-year, two-degree program in which B.S. engineering students acquire in-depth knowledge of a foreign language and culture and complete a semester-long capstone experience working abroad as an engineer during their fifth year.
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> An Interim Session Program, a three-week long foreign study program, usually conducted in January, is also available to Lafayette Engineering Students.

This paper discusses the first two programs in detail. It also presents recent developments, including the use of two-way video conferencing to offer necessary technical courses to Lafayette engineering students studying abroad.

Interim Session courses offer three-weeks of full-time foreign study under the on-site direction of Lafayette faculty members to groups of fifteen to twenty-five students. Several Interim Session courses are available each year. This year's courses are being taught in Africa, China, Germany and the Czech Republic, and Great Britain. Interim courses are equivalent to three-credit on-campus courses and are usually considered to social science or humanities electives for engineering students.

Study Abroad

Semester-long or year-long study abroad has been long recognized at Lafayette as an invaluable educational experience. Study abroad is considered particularly valuable if it gives the student experience in functioning in a non-English speaking society. In-depth immersion in a foreign culture is always a primary goal of study abroad at Lafayette.

The highly structured, sequential nature of typical U.S. undergraduate engineering curricula tends to discourage students from studying abroad. Foreign institutions only rarely offer the specialized, often institutuion-specific, technical courses, required by U.S. engineering curricula. Students can usually only participate in study abroad if they are prepared to "fall out-of-sequence" and extend the time required to earn their B.S. engineering degree. Those few foreign

institutions offering technical courses suitable for U.S. students tend to be located in English-speaking countries, i.e. Great Britain and Australia.

Lafayette engineering students have, in the past, faced all the above obstacles to study abroad plus an additional one. Partially because Lafayette's tuition is representative of its status as a highly-selective private institution, and partially because of its prevailing institutional culture, its students are not often willing to spend more than the normal four years to earn their B.S. degree.

A study abroad program intended to facilitate study abroad for Lafayette engineering students was set up in the fall semester of 1990. Students participating in the program can complete the requirements for any Lafayette B.S. engineering degree in four years with only a minimum of additional effort. The program gives students an in-depth immersion in a non-English speaking culture.

The Lafayette engineering study abroad program was set up in partnership with Vesalius College, a relatively small, semi-autonomous component of the Flemish-speaking Vrije Universiteit Brussels, in Brussels Belgium. Vesalius offers U.S. style undergraduate education in a European context and setting. Its student body and faculty are highly international, with representatives from many countries, both European and non-European. Vesalius courses are taught in English. Its students enjoy the small class sizes and strong student-faculty interactions associated with private U.S. undergraduate institutions. They simultaneously enjoy all the facilities and support services of the much larger Vrije Universiteit.

Like all Lafayette study abroad programs, the engineering program at Vesalius College is faculty-developed and faculty-directed. It was by developed by the author based on a previous non-engineering program at Vesalius. He then served as on-site director of the new program for its first year of operation. Other Lafayette faculty members have served as on-site director in subsequent years. The author and several others have served in this capacity more than once. The importance of the faculty role in organizing and directing the program cannot be overemphasized

Lafayette offers four EAC/ABET accredited B.S. engineering curricula. They feature a common first year of study and many common courses during the second year. In order make it possible for all B.S. engineering students to participate, the program at Vesalius College focuses on the sophomore year. Until the current academic year, students spent the fall semester of their sophomore year at Vesalius. Beginning this year, students will, instead, spend the spring semester there. They will, as a result, be more academically mature and even more ready to take full educational advantage of their semester abroad.

Existing Vesalius College courses in calculus, differential equations, and electrical circuits were found to generally meet the needs of Lafayette students. Necessary modifications were obtained through discussions with Vesalius faculty and administrators. A fall semester course in statics was required until this year. It was not originally offered by Vesalius and was usually taught by on-site Lafayette faculty members. On two recent occasions, Vesalius faculty members have taught it based on a Lafayette prescribed model.

With the change of the program to the spring sophomore semester, a course in statics is no longer required. Civil and mechanical engineering students now, however, require a course in strength of materials, which Vesalius does not presently offer. The author will teach the required strength of materials course to the students in Brussels from Lafayette via two-way interactive video conferencing. Because of differences in academic year schedules at Lafayette and Vesalius, the course will be taught in a special "study abroad"section with no on-campus Lafayette students enrolled.

Three hours per week of video class are scheduled for the course. Much of this time will be spent in active two-way discussions of course material and homework solutions with the five Lafayette students and two or three Vesalius students enrolled. Posting the author's class notes and other extensive supporting materials on the World Wide Web for the students to access directly will "free-up" class time for discussion. Students will also communicate with the author through a Web Bulletin Board set up and maintained for this purpose. The course will maintain the same strong faculty-student interactions found on-campus both at Lafayette and at Vesalius.

Offering the strength of materials course through two-way active video conferencing is obviously expensive, particularly given the relatively small number of students involved. Invaluable experience will, however, be acquired. It will permit us, as communication and equipment costs continue to fall sharply, to offer a variety of study abroad technical courses to students at Vesalius, as well as other locations via bridge connections. Study abroad options for Lafayette engineering students will be considerably expanded. It will also be possible to meet the needs of engineering students from other U.S. institutions who may choose to participate in Lafayette study abroad programs.

Lafayette engineering students studying at Vesalius take at least one required social science-humanities course, in addition to their technical courses. The course was developed through the efforts of on-site Lafayette faculty members. It is intended to meet the specific needs of Lafayette students, and other study abroad students from the U.S. It features a number of extended weekend and school break international field trips to locations including Paris, Cologne, Aachen, and Amsterdam, as well as a number of day trips to Belgian locations, including Antwerp, Bruges, and Tournai. Field trips, organized in consultation with the on-site Lafayette faculty member, are coordinated with assigned readings, in-class lectures, and student papers and projects. The course serves as an excellent introduction to northern European history and culture.

Lafayette engineering students are strongly encouraged, though not required, to study one of the two major Belgian languages, Flemish and French, while at Vesalius. Many already have some knowledge of French. Although English is widely spoken in Belgium, students able to communicate in one of the Belgian languages, even on an elementary level, find their experience there noticeably enhanced.

Students achieve an in-depth immersion into Belgian society through their semester-long relationships as guests in the homes of Belgian host-families. Students often become virtual family members, sharing fully in family events including vacations and weddings. Students also

become accustomed to functioning as members-at-large of Belgian society through daily commuting to school using public transportation, dealing with government bureaucracies to obtain visas, residence permits and various student passes, shopping, and the other necessary activities of daily life. The Vesalius College staff, the on-site Lafayette program director, and their host families stand ready to assist them when necessary in these efforts.

Students quickly become integrated into the Vesalius College student body. Because it is strongly international, with only a minority of native Belgian students, it is particularly open and welcoming to other newcomers. Lafayette students quickly form friendships with Vesalius students which give them ready entry into Brussels student social life.

Lafayette engineering students invariably return from Brussels well pleased with their experience there on both an academic and a personal level. They often feel that it was the high point of their undergraduate years. Now that the program at Vesalius is firmly established and featured in admissions materials, students frequently indicate that its availability played a major role in their decision to attend Lafayette.

INTERNATIONAL STUDIES DEGREE PROGRAM

Continuing globalization of industry and technology is leading to increasingly attractive career opportunities for engineers with the strong foreign language proficiency and understanding of foreign culture needed to support an internationally oriented career. The Lafayette International Studies degree program enables highly capable and highly motivated B.S. engineering students to prepare for these opportunities. It recognizes their accomplishment in doing so by awarding them a second, A.B., degree.

Students enrolled in the program complete all the normal requirements for one of the four EAC/ABET accredited Lafayette B.S. engineering degrees. They earn their A.B. in International Studies degree by completing a number of additional, program specific requirements. Five years are normally necessary to complete the two-degree program.

Foreign language study is the cornerstone of the International Studies program. Students work toward acquiring near-native proficiency in French, German, or Spanish. They complete at least the equivalent of three-years of college level study in one of the languages and are strongly encouraged to take additional advanced courses on an as-available basis. The most common additional courses are advanced conversation courses taught on a small group, i.e, four to six students, basis. In addition to competency in their language of choice, students also develop the study skills and thought processes which will enable them to quickly master other languages as-needed by their career progressions.

Additional course requirements assist students to develop an in-depth knowledge and appreciation of foreign culture and society. These include prescribed courses in international politics and history. They also include a coherent sequence of three student-selected upper level courses in art, economics, foreign language and literature, government and law or history related to countries where the student's language of proficiency is spoken. In addition, students

participate in a senior seminar focused on international affairs.

The capstone experience for the program is a practicum involving total immersion, working as a graduate engineer, in a country where the student's language of proficiency is spoken. Student will spend one of the semesters of their fifth year of study completing their practicum. Practicum experiences will be developed, supervised, and graded by a Lafayette faculty member, typically the program chair. On-site consultations and evaluations, supplemented by video conferencing, will be part of the supervision and grading process. Written student documentation of practicum performance and accomplishments will also be part of the process. When appropriate, student documentation will be in the relevant foreign language.

Students may choose to spend their entire fifth year of study abroad, combining the practicum with a semester of study at a foreign institution. Courses would be taken to complete the non-engineering, i.e. foreign culture, requirements of the program. Students will normally complete all B.S. engineering degree requirements during their first four years of study.

The International Studies degree program was approved in the spring of 1995 and is now in its second year of operation. Its implementation, although still incomplete, is proceeding smoothly. Several students are enrolled in the program with junior status, and several others with sophomore status. French, German, and Spanish have all been chosen as language of proficiency by at least one of the students. The first practicum experiences are scheduled for the fall of 1998. Several industrial organizations have already voiced a strong interest in acting as a practicum host. At least during the initial start-up phase of the program, there appear to be many more companies interested in hosting a practicum then we will have students available.

Although no students have as yet progressed through the program far enough to begin their practicum experiences, related preliminary summer employment abroad has become available. One student spent last summer working as an engineer in Europe and similar opportunities exist for two other students this summer. Further development of summer engineering positions in Europe is expected to serve as a valuable program enhancement. It will supplement the required fifth year practicum and give students even more experience in working internationally.

Recruiting for the program among graduating high school students began this academic year with the availability of descriptive brochures and full program coverage in Admissions Office materials. A soon-to-be-implemented World Wide Web program home page will further inform prospective students of its availability. As the program becomes firmly established, it is expected to serve as a "magnet" attracting exceptionally well-qualified and highly-motivated students to Lafayette.

As experience and confidence in developing and supervising successful practicum experiences is acquired, program expansion to include additional languages and countries is anticipated. Potential students have already expressed interest in Chinese, Japanese, and Russian, the other languages available for study at Lafayette. Preliminary contacts with appropriate industrial organizations have been encouraging and one or more additional languages will probably be added shortly.

Although the engineering study abroad program in Brussels and the International Studies degree program are independent, a strong synergy has developed between them. Most of the students currently enrolled in the International Studies program have spent or are planning to spend a sophomore semester in Brussels. Those International Studies students choosing not to participate in study abroad in Brussels have had or are planning other extended foreign study or travel experiences.

CONCLUSION

The Lafayette College study abroad program in Brussels and the recently introduced International Studies degree program serve to strongly internationalize the Lafayette engineering curriculum. Both programs give students invaluable preparation for practicing engineering in an international context. The International Studies program, in particular, gives students the near-native foreign language proficiency and in-depth understanding of foreign culture and society necessary for international success.

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