

Master in Civil Engineering: A Proposed Joint Degree Model between US and Latin American Universities

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ABSTRACT

During the last decades, multiple international curricular joint ventures have been implemented not only in Europe and the US, but also in many other places all over the world. These initiatives have encompassed universities, corporations, non-profit or non-governmental organizations and have been attempted to teach diverse areas of knowledge. Despite the fact these initiatives have been increasing during the last years, this increment has not been as intense neither in the US nor in Latin America as in other places, i.e. Europe. This paper shows a proposed joint program between the US and Latin American universities to teach a Master in Civil Engineering.

Keywords

Graduate joint degree, civil engineering, distance education, US, Latin America.

1. INTRODUCTION

Since civil engineering began being taught in the 18th century, different approaches have been intended in order to improve teaching in civil engineering. These approaches have considered two different points of view: theoretical, commonly used in Europe, and practical, more common in the United States (Aparicio and Ruiz-Teran, 2007). In relation to graduate education, particularly in the US, in 1998, ASCE's Board of Direction, recognizing the importance of graduate education, adopted the "*Policy Statement 465: First Professional Degree, which supported the concept that the master's degree or an equivalent would be required for a graduate engineer to practice civil engineering at the professional level*" (Nowatzki, 2003).

Regarding joint degree programs, they are found across diverse disciplines and between countries (Duke and Victorova, 1998). These multiple international curricular joint ventures have been implemented not only in Europe and the US, but also in many other places all over the world (Hunger et al., 2004). During the last years, Joint and Double Degrees have been discussed in order to incorporate them into higher education programs, with particular emphasis on the European educational systems (Schüle, 2006).

On the other hand, joint degrees are commonly carried out as a result of cooperation between higher education institutions located in different countries and within different education systems (Rauhvargers et al., 2003). In this way, this paper shows a proposed joint degree program between the US and Latin American universities, specifically to teach a Master in Civil Engineering.

2. LITERATURE REVIEW

2.1 Learning-Teaching process of engineering

Engineering education has undergone several changes during the past years; civil engineering has not been an exception. In order to understand the implications of the incorporation of joint programs into the learning-teaching process of engineering, we must answer the question: What does the learning-teaching process mean?

Teaching occurs only through the mutual interplay of an instructional medium and the efforts of learners to acquire information, principles, or skills (Hohn, 1995). Accordingly, teaching of engineering should be based on examples and experiences given by the teacher within an instructional medium. In case of joint degree programs, the examples and experiences are given by instructors. The instructional medium should be a hybrid academic environment between institutions. Learning-teaching in engineering education consists of several styles, which take into account that students learn in many ways, by seeing and hearing; reflecting and acting; reasoning logically and intuitively; memorizing and visualizing and drawing analogies and building mathematical models (Felder and Silverman, 1998). All the previously-mentioned aspects should be incorporated into the learning-teaching process of civil engineering through a joint degree program.

2.2 Collaboration and co-operation in education

Over forty-five years ago, the world-renowned specialist in anthropology Ashley Montagu said: “*Without the cooperation of its members society cannot survive, and the society of man has survived because the cooperativeness of its members made survival possible.... It was not an advantageous individual here and there who did so, but the group. In human societies the individuals who are most likely to survive are those who are best enabled to do so by their group*”, (1965). Collaboration is the future of the world; a world which depends on the constructive and competent management, as well as interdependence in family, work, community, and societal environments (Johnson et al., 1994).

Collaboration has diverse potential benefits and involves new relations between two or more entities, such as professionals, organizations, government systems, etc. (Lawson, 2004). On the other hand, improvements in communication and recent considerable technological advances associated with computer-based communication technologies have brought the promise of great benefits to distance education (Bernard et al., 2000). In other words, through these improvements in communication technologies, today is easier than ever to think of joint degrees across disciplines and countries. This paper proposes a model for a Master in Civil Engineering, which involves two higher education institutions, analyze the benefits and takes into account the advantages of collaboration through the use of effective communication technologies (online courses, for example).

International co-operation is not a new concept; at the end of the XIX century the first initiatives to formalize the international co-operation was carried out by founding the International Co-operative Alliance in Europe (ICA, 2010). In higher education, co-operation in Europe came from euphoria to pragmatism at the end of the 70s’ (Smith, 1980). Nowadays, joint degree programs have incorporated the concept of co-operation into the framework of their models (Hunger et al., 2004).

2.3 Distance education and e-learning

According to Hanna (1998), the development of the worldwide web, digital satellite technology, and the building of simulated learning environments were predicted to have effects upon learning environments at all levels. Today, nobody conceives education without technology; both have been brought together, changing the classroom as well as the roles of the teachers and students (Adcock, 2008). Moreover, as previously mentioned, technological advances have increased the popularity of Distance Education (Bernard et al., 2000).

Computer applications (software) and technologies that support the interaction between students and instructors are still incipient but growing (Elluminate, 2010). The proposal of joint degree programs in Civil Engineering considers online classes allowing students to watch the lectures in the program website; to use video conferences to interact with professors and; to work with their classmates using web conferencing or social networking tools.

2.4 Joint degree programs

Since that the Bologna declaration (1999) was signed by 29 European countries at the end of the XX century, expectations regarding the creation of joint degree programs have been high (Tauch and Rauhvargers, 2002). However, joint degrees have experienced some difficulties, particularly related to legal recognition of the degrees. Fortunately, under the Bologna process a “process of harmonization” is being seen and structures are becoming more comparable and compatible (Zgaga, 2004). In the US, the Institute of International Education (IIE) and Freie

Universität Berlin have recently released the book “Joint and Double Degree programs: An Emerging Model for Transatlantic Exchange” (2009), which includes practical recommendations for developing and delivering collaborative degree programs between the US and European universities.

There is not a unique definition for joint degree. According to the ENIC (European Network of Information Centres) and the NARIC (National Academic Recognition Information Centres) “*A joint degree shall, for the purposes of this Recommendation, be understood as referring to a higher education qualification issued jointly by at least two higher education institutions on the basis of a study program developed and/or provided jointly by these institutions, possibly also in cooperation with other institutions. A joint degree may be issued as: a) a joint diploma in addition to national diplomas, b) a joint diploma issued by the institutions offering the study program in question without being accompanied by a national diploma, c) (a) national diploma(s) issued officially as the only attestation of the joint qualification in question*”.

Other definition is proposed by Schüle (2006) as “*a single diploma issued by two or more institutions offering an integrated study program. The single diploma (Bachelor, Master, Doctor) is signed by the rectors of all participating universities and recognized as substitute of the national diplomas*”.

From both definitions, it is possible to extract the core requirements to be included in joint degree programs:

- It should be given by at least two higher education institutions; however, it could be given in cooperation with other institutions.
- It should be signed by the highest representative of each participating institution (president).
- It should be recognized as substitute of the national diplomas in each country involved.

Based on the above-mentioned definitions, there are not indications about physical locations of students; nevertheless, joint degree programs are usually taught in each participating institutions, especially when these institutions are located abroad because of the benefits of globalization and internationalization (McCabe, 2001). However, despite the importance of studying abroad, technology can help institutions to transcend the physical time and space constraints of a traditional classroom to reach students in remote locations (Eckel et al., 2004).

On the other hand, these definitions do not include any explicit indication about the accreditation of the programs (only an implicit indication through the recognition of the diplomas); however, in the US and Europe there are institutions which regulate the quality of higher education institutions (CHEA – Council for Higher Education Accreditation, US; ENQA – European Association for Quality Assurance in Higher Education, Europe).

Therefore, according to the previous ideas —accreditation and physical locations of the programs—, a fourth and a fifth requirement should be added to the list of requirements to be accomplished by a joint degree program:

- It should be accredited.
- It could be taught either online or in-class.

2.5 Joint degree programs in engineering

Joint degree programs are reaching different areas of knowledge; though in Europe, they are most commonly awarded in economics/business and engineering, followed by law and management (Tauch and Rauhvargers, 2002). These joint degree programs in engineering are one of the most taught in Europe. In the US, according to Chow et al. (NAFSA, 2009), the majority of the graduate programs are awarded in business and management, and engineering (33% of the total). Interestingly enough, the most popular academic disciplines for collaborative degree programs between the US and Europe are Business and Management and Engineering (IIE, 2009). The requirements for admission into these programs are similar to graduate programs, and their quality is assured through attending universities accredited by ABET (Accreditation Board for Engineering and Technology) in the US and the European Network for Accreditation of Engineering Education (ENAE) in Europe.

Regarding language, English is by far the most used one for joint degree programs instruction, though these programs usually offer language training both at home and abroad (IIE, 2009). Moreover, English has a high relevance in terms of globalization and plays an important role in the current higher education (Altbach, 2004).

Between the US and Latin America and Caribbean, some initiatives have already been intended to internationalize the curriculums of the institutions involved, with specific applications within the undergraduate curriculums, such as double degree programs (Lindner and Cárdenas, 2009). Joint programs and double degree programs bring value, recognition and acceptance to the programs of newly established universities (usually located in Latin America and Caribbean), and the established universities (usually located in the US) benefit in such partnerships through a widening of their program, enhancing their sphere of influence, and helping build national or regional capabilities for education, research and development (Sastry et al., 2007).

However, in spite of some efforts have been undertaken in Latin America, current local programs do not have the international component to offer to their students. Partnering between Latin/South American Universities and North American Universities is certainly a plus as it comes to address the globalization of education issue. In other words, it puts together engineers from different regions of the world, with different backgrounds, to get a broader exposure through the program. Moreover, the benefits extend themselves to reach future partnerships. Nevertheless, to get to the point in where a program of this nature will be sustainable, participating institutions must already have strong graduate programs. Their partnership will then have to be materialized through the signature of collaboration agreements between them, and their corresponding colleges of engineering.

2.6 Number of years between civil engineering programs in the US and Latin America: the difference

In the US, since the Land Grant College Act of 1862, the program of engineering has consisted of four-year program format, while other professions (e.g. medicine, law and dentistry) have increased the number of years of instruction to six years or more (Lyons, 2000). In civil engineering, some efforts have been done to incorporate innovations in its curriculum (Pauschke et al., 1996); however, the number of years — four — has remained the same.

Civil engineering has been present in Latin America since century XVIII (Domínguez and Saldaña, 2004). In comparison with the US, in Latin America, most of the programs consist of a curriculum of five years (e.g. Mexico, Colombia, and Ecuador, among others) and even more (e.g. Chile with a curriculum of six years).

The difference in the number of years between the undergraduate programs implies that some graduate courses taught in the US correspond to undergraduate courses taught in Latin America during the last year. For that reason, at the moment of choosing the joint program courses, it is crucial to review both undergraduate programs in order to teach topics which accomplish the expectancies as well in the US as in Latin America.

3. THE PROPOSED MODEL

The proposal of a model for joint master program in civil engineering has to gather all the previously mentioned aspects related to joint degree programs. Moreover, it should include some administrative characteristics which are inherent in the creation of any academic program.

3.1 Mission and Vision for the joint Master degree program

The mission of the program is to prepare students to succeed in an environment which demands technical and affordable solutions. Globalization and the increasing role of technology in daily life require students with the ability to communicate in more than one language and to use technology to interact globally (online education).

The vision of the program is to introduce a new joint master program between the US and Latin America. A number of students will improve their skills to develop professional activities effectively as civil engineers, not only in the United States but also in Central and South America.

3.2. Collaboration Agreement between institutions involved

It is recommended that these programs be housed in each institution and protected through the establishment of a Collaboration Agreement between Universities and their Colleges of Engineering. These give collaborating universities ownership of the program. The laws that will govern these programs are the laws and bylaws of the

corresponding institutions, and the laws of the corresponding Latin American country, and the laws of the US. They do not interfere with each other and allow dealing with administrative, legal and financial issues.

3.3 Requirements for admission

The following are the minimum requirements for admission:

- Bachelor of Sciences in Civil Engineering.
- Three letters of recommendations.
- Statement of Purpose.
- A minimum score of 1100 on the Graduate Record Examination.
- Latin American students have to obtain a minimum of 80 on the Internet version of TOEFL.
- American students have to pass the Intermediate Level D.E.L.E. Spanish Exam.

3.4 General description of the program

As is usual for a master program, this joint program would consist of a minimum of 30 credit hours. These credit hours would include a minimum of 24 credit hours of course work and 6 credit hours to complete a thesis. The first 24 credit hours would be separated in 8 courses with 3 credit hours each. For the thesis, a graduate advisor would be assigned to advise the student about the selection of the courses and the topic for his/her thesis. On the other hand, the courses would be taught in English (4) and Spanish (4). The thesis would be required in English.

The courses would be taught during 3 academic semesters. During the first two semesters, students should attend their courses in their home country. Despite the fact that students will be attending their own universities during the first two semesters, some of the courses would be taught online in a foreign language (Spanish or English depending on the course). Students who successfully finish their first two semester would travel abroad, in order to finish the Master program in the partner institution.

In order to reach a consensus about grading between systems (the US and Latin America), the tests, quizzes, assignments and theses would be graded according to a percentage scale with a minimum of 70% to pass a course.

3.5 Double degree of the program

In spite of this program has been defined as a joint degree program, an important issue for students is to have the opportunity of receiving a degree which can be recognized as well in the US as in the Latin American country. The European Commission for Education & Training defines a double (or multiple) degree as “*two or more nationally-recognized diplomas issued officially by two or more institutions involved in an integrated study program*” (Schüle, 2006). With regard to this joint program, as previously-mentioned, the total number of credits would be 30 (3 credits per course plus 6 research credits for the thesis). In order to give students the possibility of obtaining a double degree, students should take at least 15 credits within each institution, which can consist of 12 credits of courses and 3 credits of research as part of the thesis.

3.6 A proposed schema for the joint degree program

As mentioned, there are several differences between the US and Latin America in terms of academic programs in civil engineering. However, it is possible to work with both undergraduate programs in order to get a graduate joint program which matches the expectancies of participating institutions. The proposal to overcome the differences between programs is shown in Figure 1.

Based on the Master program previously shown, the core civil engineering courses taught during the first semester should be structured considering the background of the students (the US and Latin America). These courses should include topics which have not been covered during the undergraduate programs, but consider some common courses as prerequisites. The following is a proposal for these core civil engineering courses:

- Civil Engineering Systems: Advanced management skills and procedures in support of design and construction practice in civil engineering industry. The prerequisites for this course would be: Engineering Statistics, Civil Engineering Cost Analysis and Methods and Management.
- Advanced Computer Methods in Civil Engineering: Advanced computing skills in software programs across the multiple areas in Civil Engineering (Excel, Mathcad, Matlab, SAP, SPSS and ExtendSim). The prerequisites for this course would be: Computer Methods in Civil Engineering and Engineering Statistics.
- Principles of Applied Civil Engineering Design: Advanced process involving detailed analysis, discernment, and experience to generate construction drawing, specifications and bid schedules required to allow contractor to bid and construct projects. The prerequisites for this course would be: Capstone course.

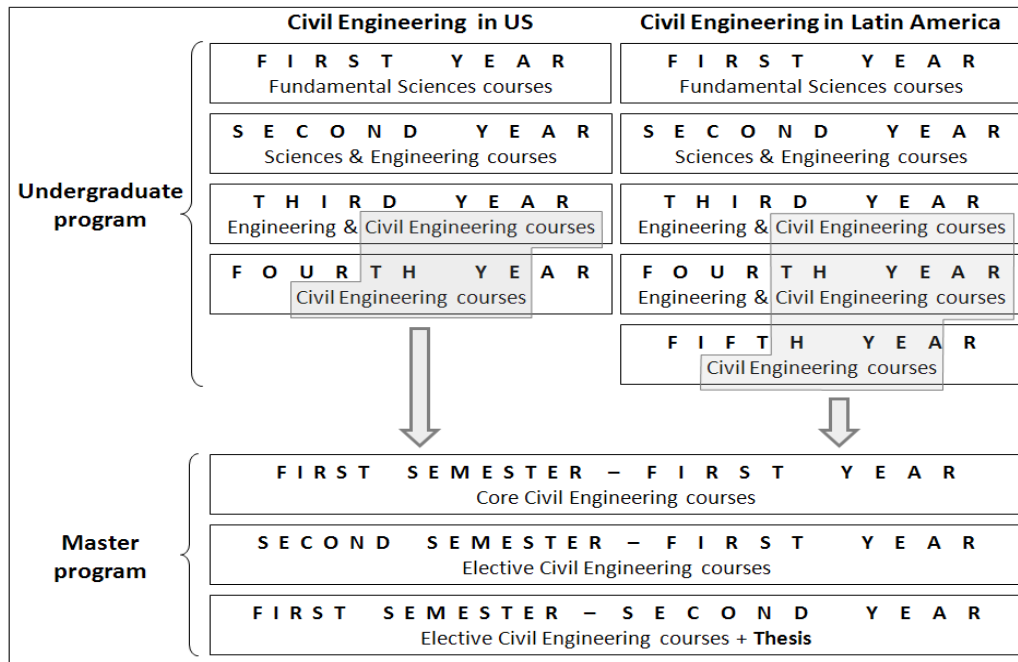


Figure 1 – Undergraduate and proposed graduate civil engineering program in the US and Latin American universities.

The next two semesters would include electives courses and the thesis, as shown in Figure 2.

The elective courses would be categorized by track: structures, construction, transportation, hydrology and water resources and geotechnical track. Students interested in a particular track are not required to take courses of their track of interest only. Students could always choose a general track which encompasses all the areas mentioned (University of Florida, 2010).

- Structures track: Design of Temporary Structures; Seismic Analysis and Modeling; Wind Design; Advanced Concrete Design; Advanced Steel Design; Advanced Masonry Design; Structural reliability and stochastic structural optimization.
- Construction track: Engineering Project Management; Real Estate Management; Advanced Planning & Scheduling Management; Simulation and Optimization of Construction processes; Sustainable Construction; Equipment and Heavy Construction; Building Construction; Productivity in Construction.
- Transportation track: Control Traffic Systems; Traffic Engineering; Freeway Operations and Simulation; Transportation Project Management; Transportation Supply and Demand Analysis; Computational Methods in Transportation Engineering.
- Hydrology and water resources: Advanced Fluid Mechanics; Computational Fluid Mechanics; River Water Quality Modeling; Water Resources Planning and Project Management; Sediment Transport; Environmental

Studies for hydraulics/hydrology projects; Hydrologic Engineering for Dams; Turbulence Modeling for Engineering Applications.

- Geotechnical track: Advanced Soil Mechanics; Advanced Foundation Design; Rock Mechanics and Engineering Geology; Numerical Methods of Geomechanics; Earth Retaining Systems and Slope Stability; Groundwater Problems in Geotechnical Engineering.

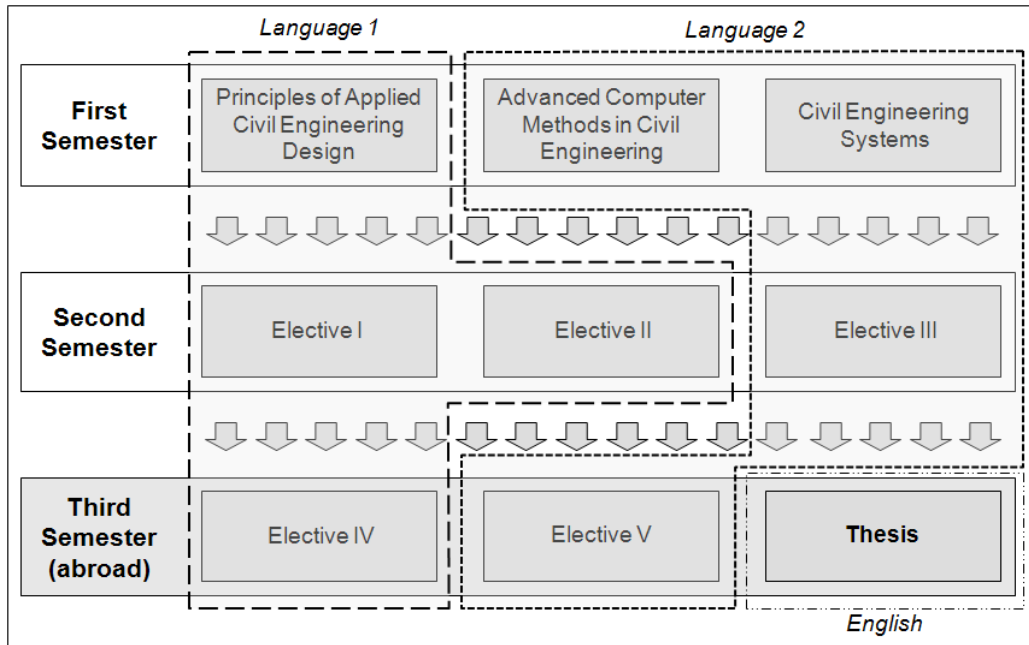


Figure 2 – Proposed schema for a joint degree program between the US and Latin American universities

3.7 Accreditation of the program

In the US the quality of the joint degree program should be assured by ABET. In Latin America the accreditation should be given by local accreditation organizations. Because of the high number of countries in Latin America, a couple of examples have been brought only, associated with governmental organizations for accreditation of academic programs in higher education. For example, in Chile, the accrediting organization is the “Comisión Nacional de Acreditación” (National Accreditation Committee), which is responsible for the supervision and control of the Chilean higher education academic programs (CNA Chile, 2010). In Colombia in turn; the “Consejo Nacional de Acreditación” (National Accreditation Council), is the entity which guarantees the quality of higher education, through a set of policies, strategies, processes and organizations (CNA Colombia, 2010).

3.8 Financing of the program

To avoid exchange of funds between institutions, the student should pay for its credits in the corresponding institution. This simplifies issues, and addresses others of interest for the local academic institution, in terms of health insurance, registration, compliance with the academics, etc. Each institution will charge its own expenses. In other words, the graduate student has to pay the tuition, fees, insurances and others to the institution where he/she will be studying. In relation to the travel/living expenses, they have to be pay by the own student.

3.9 Legal and administrative aspects of the program

If students somehow need advice regarding administrative issues, they should seek information within the corresponding department where they are currently attending. In addition, each university has nowadays an International Center who has as one of its main goals to help international students. Regarding legal issues, universities do have a legal department that is devoted to help students with these concerns. Should one of the

participating universities lack these services in place, these point should be considered as a serious matter to refrain from signing the needed Collaboration Agreement.

Although graduates from these programs will theoretically enjoy the possibility to work in the US and in the Latin American countries, this has to consider a secondary (legal) prerequisite. Namely, the issue becomes a residential or citizenship one. In the US the graduate can work if and only if he/she is a legal resident or citizen. The same happens to a US citizen trying to work in Latin America, although the corresponding laws are less stringent.

3.10 Technical aspects of the program

Laboratories (structures, hydraulics, geotechnical, etc.) are crucial within civil engineering programs. This proposed joint degree model considers that laboratories are part of the courses taken by the student in the local, or abroad, university. Each university will prepare and evaluate performance in laboratories as they usually do for all their regular courses, as established by their own bylaws. Also, both institutions have to provide full-equipped computer classrooms to give students high speed access to watch the lectures in the program website; to use video conferences to interact with professors and classmates. Worth is to mention that these issues are discussed and agreed upon by the corresponding liaisons of the program in each partner university, according to the collaboration agreement previously signed.

3.11 Diploma

At the end of the program, students would be awarded with a double degree which would be recognized both in the US and in the Latin American country where the Master program was taught. As previously-mentioned, this double degree is feasible because students have to take a minimum of 15 credits within each institutions (30 credits for the whole program), and this has to be specifically established in the collaboration agreement between the institutions involved and their corresponding colleges of engineering. For example, in Europe the diploma is used as an umbrella for all types of degrees (joint degrees and double degrees) and, at the same time, as description of the physical degree certificate (Schüle, 2006).

4. THE PROGRAM BENEFITS

In a proposal like this is hard to find any disadvantages for it. Nowadays it is certainly hard to believe that the current college educational schemes will survive the test of time. Our world requires every day engineers with a broader, more global education.

As discussed before, future engineers will need to interact with their peers in different countries in the globe, in multinational projects. Therefore the design of a collaboration program that considers a double-bilingual masters degree in Civil Engineering is certainly a natural program to have.

In this context, let's explore a few ideas among the myriad of possible advantages for the participating US-Latin American partner universities. Although obvious, a note of caution tells us that many universities, of all types of academic quality, will attempt to offer this program. Clearly only the few serious ones will survive, as the educational market will regulate itself according to academic status. It will be of tremendous importance that partnerships be established between highly recognized colleges both in the US and in Latin America.

Some advantages are as follows:

- 1) Bilingual Characteristic: This speaks by itself. A bilingual engineer, with a dual degree from good universities in the US and in Latin America, will certainly have the advantage of knowing both languages. This will expedite the engineer hands-on any international project.
- 2) Dual-Masters-Degree: The intellectual and educational characteristics of the civil engineer with such a dual master's degree, coming from two highly recognized universities in the US and Latin America will certainly guarantee its performance.
- 3) Exposure: For each participating university this program will entail a tremendous accomplishment. International Exposure to the partner universities will increase, and be a plus. This program will put them out

there at the forefront of academics abroad. It will bring recognition to them, and surely additional programs and projects will result out of this.

- 4) Metrics: Participating colleges will see their enrollment and graduation metrics increased in their graduate programs because this program will attract more students to them.
- 5) The Students: Participating students will have the ability to have a degree that will be recognized in the US and in Latin America.

5. CONCLUSIONS

This paper has shown that joint degree programs and their benefits are present all over the world and it proposes a new one, even though; most of the programs are being lead by Europe. Some initiatives have been carried out between the US and Latin America; however, the number of current programs should increase.

From an academic point of view, despite the differences between the US and Latin America in civil engineering, it is possible to develop joint degree programs which accomplish the expectancies of higher education institutions involved. However, it is crucial to pay close attention to aspects such as: undergraduate courses taught during the last year; accreditation of institutions involved and; recognition of both the US and Latin America joint degrees. On the other hand, the proposed joint degree program allows students focus either on a specific track (structures, construction, water resources, transportation, and geotechnical engineering) or on a general track through taking courses from different areas of civil engineering.

Finally, the benefits given by this type of joint degree programs, such as bilingual characteristic, exposure and the possibility of having a degree recognized in the US and in Latin America, become a tremendous challenge and opportunity for prospective graduate students in the Americas.

REFERENCES

- ABET - Accreditation Board for Engineering and Technology, www.abet.org/, 02/19/10.
- Adcock, P. (2008). "Evolution of Teaching and Learning through Technology". *The Delta Kappa Gamma Bulletin*, Vol. 74, No. 4, pp. 37-43.
- Altbach, P. (2004). "Globalization and the University: Myths and Realities in an unequal world". *Tertiary Education and Management, the Journal of the European Higher Education Society (EAIR)*, Vol. 10, No. 1, pp. 3-25.
- Aparicio, A., and Ruiz-Teran, A. (2007). "Tradition and Innovation in Teaching Structural Design in Civil Engineering". *Journal of Professional Issues in Engineering Education and Practice*, Vol. 133, No. 4, pp. 340-349.
- Bernard, R.M., Rojo de Rubalcava, B., and St-Pierre, D. (2000). "Collaborative Online Distance Learning: Issues for Future Practice and Research". *Distance Education*, Vol. 21, No. 2, pp. 260-277.
- CHEA – Council for Higher Education Accreditation, www.chea.org/, 02/19/10.
- Chow P., Gutierrez, R., and Baumgartner, J. (2009) "The Economic Impact of International Students from a Cross-National Perspective". *NAFSA 2009 Annual Conference*, Los Angeles, USA.
- Comisión Nacional de Acreditación, CNA, Chile, www.cnachile.cl/, 02/19/10.
- Confederation of EU Rectors' Conferences and the Association of European Universities (1999). *The Bologna Declaration*, European Union, 1999.
- Consejo Nacional de Acreditación, CNA, Colombia, www.cna.gov.co/ 02/19/10.
- Domínguez, R., and Saldaña, J.J. (2004). "La Ingeniería Civil en México a finales del Porfiriato". *Simposium "La articulación ciencia-tecnología-industria en México en el siglo XIX y hasta 1940"*, VI Congreso Latinoamericano de Historia de las Ciencias y la Tecnología, Buenos Aires, Argentina.
- Department of Civil & Coastal Engineering, University of Florida, www.ce.ufl.edu, 02/19/10.
- Duke, C., and Victorova, I. (1998). "Exploring Joint Programs across Disciplines and Between Countries". *Journal of Education for Business*, Vol. 74, No. 2, pp. 99-102.
- Eckel, P.D., Green, M.F., and Affolter-Caine, B. (2004), "Curricular Joint Ventures: a new chapter in US cross-border education?" *Policy Futures in Education*, Vol. 2, No. 2, pp. 299-315.

- Elluminate Inc., E-Learning & Collaboration Solutions, www.illuminate.com/, 02/19/10.
- ENAAE, European Network for Accreditation of Engineering Education, www.enaee.eu/enaee/presentation.htm, 02/19/10.
- ENIC (European Network of Information Centres) and the NARIC (National Academic Recognition Information Centres), www.enic-naric.net/, 02/19/10.
- ENQA – European Association for Quality Assurance in Higher Education, www.enqa.eu/, 02/19/10.
- Felder, R.M., and Silverman, L.K. (1988). “Learning and Teaching Styles in Engineering Education”. *Journal of Engineering Education*, Vol. 78, No. 7, pp. 674-681.
- Hanna, D. (1998). “Higher Education in an Era of Digital Competition: Emerging Organizational Models”. *Journal for Asynchronous Learning Networks*, Vol. 2, pp. 66-95.
- Hohn, R.L. (1995). *Classroom Learning & Teaching*, XX Edition Longman Publishers, USA.
- Hunger, A., Schütz, C., Schwarz, F., and Werner, S. (2004). “Joint Degree Programs between European and Asian Universities: Concepts, Models, Structures and Tools”. *International Conference on Engineering Education and Research – Progress through Partnership*, Olomouc and Bouzov Castle, Czech Republic.
- Institute of International Education, IIE, www.iie.org/, 02/19/10.
- International Co-operative Alliance in Europe, ICA, www.ica.coop/al-ica/, 02/19/10.
- Johnson, R.T., Johnson, D.W., and Smith, K.A. (1994). “Cooperative Learning”. *Cooperative Learning Center*, University of Minnesota, Minneapolis.
- Lindner, A. and Cárdenas, C. (2009). “Internationalizing the Curriculum at the University of Florida College of Engineering: The Latin America & Caribbean Factor”. Proceedings of the *7th Latin American and Caribbean Conference for Engineering and Technology*. San Cristóbal, Venezuela.
- Lawson, H.A. (2004). “The logic of collaboration in education and the human services”. *Journal of Interprofessional Care*, Vol. 18, No 3, pp. 225-237.
- Lyons, W. (2000). “U.S. and International Engineering Education: a vision of Engineering’s future”. *Journal of Professional Issues in Engineering Education and Practices*, Vol. 126, No. 4, pp. 152-155.
- McCabe, L.T. (2001). “Globalization and Internationalization: The Impact on Education Abroad Programs”. *Journal of Studies in International Education*, Vol. 5, No. 2, pp. 138-145.
- Nowatzki, E. (2003), “Model for Education, Professional Preparation, and Licensure of Civil Engineers”. *Journal of Professional Issues in Engineering Education and Practice*, Vol. 130, No. 4, pp. 269-279.
- Pauschke, J.M., and Ingraffea, A.R. (1996). “Recent Innovations in Undergraduate Civil Engineering Curriculums”. *Journal of Professional Issues in Engineering Education and Practices*, Vol. 122, No. 3, pp. 123-133.
- Rauhvargers, A., Bergan, S., and Divis J. (2003). “United We Stand: The Recognition of Joint Degrees”. *Journal of Studies in International Education*, Vol. 7, No. 4, pp. 342-353.
- Sastry, M.K.S., Sankat, C.K., Exall, D., Srivastava, K.D., Khan, H., Copeland, B., Lewis, W. and Bhajan D. (2007). “I An Appraisal of Tertiary Level Institutional Collaboration and Joint Degree Programs in Trinidad and Tobago”. *Latin American and Caribbean Journal of Engineering Education*, Vol. 1, No. 1, pp. 27-34.
- Schüle, U. (2006). “Joint and Double Degrees within the European Higher Education Area: Towards Further Internationalization of Business Degrees”. *Consortium of International Double Degree Papers on International Business Education*, Paris-La Défense Cedex, France.
- Smith, A. (1980). “‘Europhoria’ to Pragmatism: Towards a New Start for Higher Education Co-operation in Europe?” *European Journal of Education*, Vol. 15, No. 1, pp. 77-95.
- Tauch, C., and Rauhvargers, A. (2002). “Survey on Master Degrees and Joint Degrees in Europe”. *European University Association*, Geneva, Switzerland.
- Zgaga, P. (2004). “Joint Degrees – Problems and Developments”. *Presentation at the ERASMUS-EUDORA meeting*, Linz, Austria.

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