Civil Engineering Accreditation at the University of Florida and the Universidad Catolica del Norte, Chile

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Abstract

Accreditation is an important component in the long process of assuring the quality in the engineering education. Whereas universities in the USA have dealt with accreditation for a long time, universities in Chile are having the first steps by applying both the American and the European experience. This paper is intended to compare the accreditation process undertaken by the University of Florida (UF) and the Universidad Catolica del Norte (UCN) for the undergraduate Civil Engineering program.

A side to side analysis indicates that the criteria proposed by the CNAP for assuring quality in civil engineering education do not differ much from those proposed by ABET. On the other hand, the application of the first step of the CNAP (national commission for accrediting undergraduate programs) procedure has shown the lack of preparation of the UCN in terms of accounting with the appropriate information to accomplish with the self-evaluation process. Finally, the accreditation process is more likely to be a factor that both civil engineering programs has been assessing and developing in their programs to meet the standard, which affects the quality and performance of students.

Introduction

Civil Engineering program of the University of Florida (UF) is accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET) since 1936 until present with full accreditation status. The Universidad Catolica del Norte (UCN) is in the process of accrediting the civil engineering undergraduate program, following the directions provided by the Comisión Nacional de Acreditación de Pregrado (CNAP), created in 1999.

The criteria of ABET at the UF civil engineering program along with the accreditation and self evaluation at the UCN are presented.

University of Florida Case

The ABET criteria apply to the UF civil engineering program for basic and advance level that the program have met focusing on curriculum, students, program educational objectives, program outcomes and assessment, professional component, faculty, facilities and institutional support and financial resources as the followings.

Curriculum

The UF-Civil Engineering program demonstrated that graduates have: proficiency in mathematics through differential equations; probability and statistics; calculus-based physics; and general chemistry; proficiency in a minimum of four (4) recognized major civil engineering areas; the ability to conduct laboratory experiments and to critically analyze and interpret data in more than one of the recognized major civil engineering areas; the ability to perform civil engineering design by means of design experiences integrated throughout the professional component of the curriculum; an understanding of professional practice issues such as: procurement of work; bidding versus quality based selection processes; how the design professionals and the construction professions interact to construct a project; the importance of professional licensure and continuing education; and/or other professional practice issues [1]. Regarding this criteria, the curriculum is design to meet the criteria and also flexibility for the students as shown in Figure 1 [2].

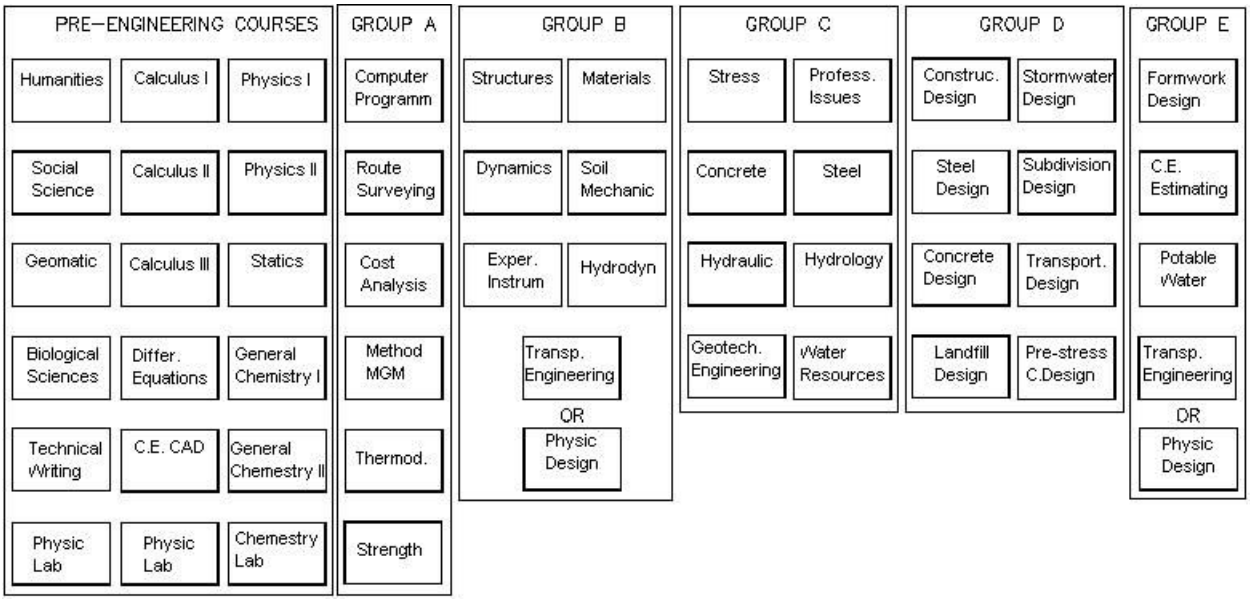

Figure 1 shows the flow chart of the civil engineering undergraduate courses at the UF.

Students

On this criterion, the quality and performance of the students and graduates are important considerations in the evaluation of an engineering program. The institution must evaluate, advice, and monitor students to determine its success in meeting program objectives. The institution must have and enforce policies for the acceptance of transfer students and for the

validation of courses taken for credit elsewhere. The institution must also have and enforce procedures to assure that all students meet all program requirements [1].

The UF-Civil Engineering Department requires a minimum grade of C is required courses. A grade point average of 2.0 is the minimum for all civil engineering courses. All B.S.C.E. students must take the Fundamentals of Engineering (FE) exam offered by the Department of Professional Regulation before graduating. Moreover, the Probation and Exclusion Policy is that an undergraduate student who falls below a 2.00 junior/senior level or university cumulative GPA or fails to make satisfactory progress will be placed on academic probation, which requires a planned pro-gram. If this program is not met, a written request must be made to the department's Committee for Admission and Retention Appeals explaining why satisfactory progress has not been made and what circumstances have changed to indicate future improvements [2].

Program Educational Objectives

The UF-Civil Engineering program and curriculum permit a graduate to enter practice and commence life-long learning through professional activities or to continue his/her preparation through graduate studies. An early engineering identity is established through a freshman engineering lab and participation in the student chapter of the American Society of Civil Engineers. Design integration is continued throughout the program. The objectives of the program which is accredited are as followings [1, 3]:

- To provide a broad general education that enhances communication skills and encourages all-around development of students, both individually and as productive members of society
- To ensure a thorough preparation in the fundamentals of science and engineering
- To provide a foundation to the planning, design, construction and operation of civil engineering projects, and
- To enhance contributions to the state, nation and profession through strong programs in teaching, re-search and service.

Program Outcomes and Assessment

The UF-Civil Engineering programs have demonstrated that their graduates have [1, 3]:
(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Professional Component
The professional component requirements specify subject areas appropriate to engineering but do not prescribe specific courses. The UF-students are prepared for engineering practice through the curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating engineering standards and realistic constraints that include most of the following considerations: economic; environmental; sustainability; manufacturability; ethical; health and safety; social; and political [1, 3].

Faculty
The faculty is the heart of any educational program. The faculty must be of sufficient number; and must have the competencies to cover all of the curricular areas of the program. There must be sufficient faculty to accommodate adequate levels of student-faculty interaction, student advising and counseling, university service activities, professional development, and interactions with industrial and professional practitioners, as well as employers of students [1].

The UF-Civil Engineering program faculties has appropriate qualifications and demonstrate sufficient authority to ensure the proper guidance of the program and to develop and implement processes for the evaluation, assessment, and continuing improvement of the program, its educational objectives and outcomes. The overall competence of the faculty is judged by such factors as education, diversity of backgrounds, engineering experience, teaching experience, ability to communicate, enthusiasm for developing more effective programs, level of scholarship, participation in professional societies, and registration as Professional Engineers [1, 3].

Facilities
Classrooms, laboratories, and associated equipment must be adequate to accomplish the program objectives and provide an atmosphere conducive to learning. Appropriate facilities must be available to foster faculty-student interaction and to create a climate that encourages professional development and professional activities. Programs must provide opportunities for students to learn the use of modern engineering tools. Computing and information infrastructures must be in place to support the scholarly activities of the students and faculty and the educational objectives of the institution [1].

Institutional Support and Financial Resources
Institutional support, financial resources, and constructive leadership must be adequate to assure the quality and continuity of the engineering program. Resources must be sufficient to attract, retain, and provide for the continued professional development of a well-qualified faculty. Resources also must be sufficient to acquire, maintain, and operate facilities and equipment appropriate for the engineering program. In addition, support personnel and institutional services must be adequate to meet program needs [1].

Chilean Case

The CNAP (*Comisión Nacional de Acreditación de Pregrado)* was created in March 1999 with the purpose of establishing an accreditation process system, which allows to promote and assure the quality in the Higher Education system [4]

CNAP conducts an accreditation process that is applicable to all undergraduate programs currently offered by Chilean universities. Undergraduate programs are encouraged to voluntarily participate in this process, which will allow them to meet quality standards in the future.

The accreditation process is focused in promoting and assuring quality in the undergraduate education. It includes methodologies and procedures for both self evaluation and external verification. In this process academics inside the program as well as those external to the institution have a relevant participation by applying criteria that address specific issues, and procedures that are well known for everyone [4].

The main objective of the accreditation process is to assure education quality at both programmatic and institutional level. For this reason it must be understood as a permanent system, applied through pre-established cycles.

The accreditation process is intended to recognize strengths and weaknesses within both the program and the institution. Also, it has to be able to identify the countermeasures to be applied to correct deficiencies detected in the evaluation process. On the other hand, the accreditation process has to be considered as a tool to check the degree of fulfillment of quality criteria assumed when the program was created.

The accreditation process is performed based on pre-established quality criteria and it considers three stages:

a) Self Evaluation
b) External evaluation by pairs
c) Statement of Accreditation

The Accreditation Process

Institutions and their different academic units have objectives and goal to accomplish. For this reason they should account with regulation's mechanisms and tools to evaluate the different process they are involved in. This continuous evaluation allows them to improve the quality by applying specific procedures at the interior of the institutions [4]. However, accreditation adds an additional component, which is the public certification that the institution and/or program subjected to an evaluation process, accomplishes with the conditions corresponding to the aspired level of quality. Moreover, accreditation is a public warranty of the evaluation results, since it utilizes an external mechanism of evaluation to validate the results of the self evaluation [4].
According with the CNAP specifications the civil engineering undergraduate programs have to be assessed in terms of both the competences of the undergrad students and 9 criteria. These criteria apply to the institution, main academic unit, and the program itself.

The competences of the undergrad students include knowledge, abilities and attitudes that all civil engineering students should account at the time of graduation. On the other hand the 9 criteria are resumed as the following:

- Purpose of the program
- Institutional Integrity
- Organizational, Administrative and Financial Structure
- Curriculum
- Human Resources
- Effectiveness of the teaching –learning process
- Results of the education process
- Infrastructure, technical support and resources for the education process
- Linkage with the external environment

The accreditation has to be understood as the public certification that the program accomplishes with the quality criteria previously defined in the program's statement of purposes [4].

Accreditation process of the Civil Engineering Program at UCN

The accreditation process of the CE undergraduate program at the UCN started by the end of 1999. This process is currently being conducted at the interior of the Department of Civil Engineering. So far only the self-evaluation process has been finished and the final report is being evaluated by the CNAP. The formal self-evaluation process started in 2000 and it was a slow process not exempt of difficulties. As a totally new experience for all the faculties members involved, this process meant the starting point in the long process of accrediting the civil engineering undergraduate program [5].

Three stages can be distinguished in the entire process of the self evaluation:

1st Stage: Data collection and analysis

This stage demanded the most of the time due mainly to the lack of available data for analysis. Even though the information existed, it was stored in incompatible formats. That issue did that new data base was prepared separately by the Department of Civil Engineering and by the Curriculum Register Office of the University. This inconsistency between the type of required data and the available information in the Register Office allowed developing several improvements in the information system of the university. Now the information system of the UCN can respond to the demand of information not only from the department of civil engineering, but also from other academic units, which have also undertaken the accreditation process and require similar information. The final information was ready to be used in a compatible format by the end of 2003 [5].

2nd Stage: Communication of the process to the faculty members.

The early period of the self evaluation (1999) did not account with any document as a guide (at that time no even the CNAP had been created). The total lack of knowledge about the procedure did that the initial enthusiasm among the faculty members of the Department of Civil

Engineering was decreasing with the time, resulting in a considerable lack of interest in the process [4].

When the time to sign the agreement for the self evaluation process between the Department and the University come, only few faculty members knew the scope of the compromise being assumed. The process was slowly taking force among the faculty members, however more than 6 months passed before some progress could be visualized. The methodology that increased the interest of the faculty members in the self evaluation process was the fact of starting working in small groups (committees) by analyzing different criteria. Each committee collected specific information to perform analysis and produce critic judgments [5].

The final report of the self evaluation process is the result of the work developed exclusively by the faculty members, therefore is possible to find some degree of incompleteness, particularly when applying the different criteria to the first years in the undergraduate curriculum. Because faculty members have little influence in the first two years of the civil engineering curriculum, some information may be missed or inappropriately considered. Likewise the participation in the final report of other faculty members (from other academic units) was not considered even though they may have an active role in the education process.

3rd Stage: Communication to students.

The participation of the students in the self evaluation process was scarce. At the beginning the inclusion of a representative of the student body was considered within the conformation of the different committees. The lack of compromise of the students and the continuous changes in the representatives leaded to the loss of this important component. Unfortunately the final report had to be performed without any input coming from the student body. For this reason the communication of the results of the self evaluation process to the students becomes a crucial step in the entire process, since they are suppose to be the main beneficed with the improvement as a result of the accreditation.

The last step is to communicate the result of the self evaluation process to continue toward the elaboration of an improvement plan, which has to be consequent with the result of the self evaluation, the available budget and the defined objectives [5].

Next steps in the accreditation process at UCN

The next steps in the accreditation process of the CE undergraduate program at UCN are the external evaluation and the statement of accreditation. Now that the self-evaluation has been completed, the CNAP must nominate the external evaluation team. This process should be finished by the end of the first semester of 2004. The future process is described in the following paragraphs.

External Evaluation.

The external evaluation is the process performed by independent evaluators contracted by CNAP. These evaluators will submit a report containing judgments concerned about the self-evaluation process. Likewise, the report should show both the strongest and the weakest points of the program, based on the graduate profile and the pre-defined criteria. The evaluator team has to be formed by faculty members of external institutions and/or professionals of acknowledged prestige in the civil engineering area. The job of the external team is to revise the self-evaluation process and to visit the university by making contact with authorities, faculty members and students. The external evaluators also have to contact former students to evaluate the results of the education process [4].

Statement of Accreditation.

The last step is the statement of accreditation. This statement is adopted by the CNAP based on the pre-defined criteria, the self-evaluation report and the external evaluation report. The final statement can be either of the following:

- Accreditation of the program for a maximum of 7 years and a minimum of 2 years
- Reject the accreditation when the program does not reach an adequate level of accomplishment of the evaluation criteria.

When the program is to be accredited, the accreditation time is set based on the nature of the observations formulated and the necessary time to face the problems and work them out. If the accreditation is rejected, the program accounts with two years to apply for a new accreditation process [4].

Discussion

The ABET criteria apply to the UF civil engineering program for basic and advance level, focusing on students, program educational objectives, program outcomes and assessment, professional component, faculty, facilities and institutional support and financial resources. The most recent accreditation was obtained in 2001 and it expires in 2007. For the UCN, the steps to complete the accreditation process are: external evaluation and final statement. Since 2000 the UCN-Civil Engineering department, as the responsible academic unit, has been working in the internal evaluation, which has been no exempt of difficulties, mainly due to the lack of information for developing further analysis. It can be noticed that the criteria applied for both ABET and CNAP are very similar, focusing in the grad student profile, program and institution issues. However, whereas accreditation is a new process being carried out in several undergraduate programs in Chile, the ABET has been functioning in the USA for a very long time improving the educational process in American universities.

Conclusion

The application of the first step of the CNAP procedure has shown the lack of preparation of the UCN in terms of accounting with the appropriate information to accomplish with the self-evaluation process. However, great effort has been put in carrying out this long preliminary process that is the base for the subsequent steps. On the other hand the accreditation process at UF is a completed process that comes from several years ago. This is a direct consequence of the differences between the American and the Chilean university system. In the coming years UF has to work trying to maintain the status that the accreditation confers by constantly improving not only the methodological and curricular aspects, but also the infrastructure needed. For UCN a long way to go is still left in the process of assuring the quality of the civil engineering education. After finishing the self-evaluation process, the external evaluation has to be performed to finally obtain the accreditation. At the end, the accreditation process is more likely to be a factor that both civil engineering programs has been assessing and developing in their programs to meet the standard, which affects the quality and performance of students.

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