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Port Engineering Graduation Program: Designed for Future

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Abstract

Brazil has a large sea coast portion something around eight thousand Kilometers and the majority of them of sand in full beaches however in some places there are natural harbors as the harbor of Santos Sea Port . Such geographical conditions pushed by historical events and the necessity of goods escape during colonization period have created some very important sea ports in the country. Nowadays Santos Sea Port moves, per year, more than 60 million tons of several loads, unimaginable number in 1892, when it operated 125 thousand tons. With 12 km of wharf, among the two margins of the estuary of Santos, the port entered in new exploration phase, consequence of the Law 8.630/93, with leasing of areas and facilities to the private initiative, by public auctions. The present work has the goal to show a new graduation program designed, developed and implemented by COPEC Institute of Education attending the demand of qualified engineers to perform in the area of sea port administration as well as international maritime trading and operations. Some very important aspects of the engineering education in the country will be also briefly discussed viewing the present and future status of engineering education focusing mainly the program. The main aspect of this program is that it comes to supply the region with the best professional to act and to perform in the new modern sea port that offers a whole spectrum of opportunities.

Keywords: Ocean sciences, competencies, technology, sea port, qualification.

1. Introduction

Engineers as problem solvers should be more aware of the impacts of any development also in social level once the impacts of unification of world in any level has consequences for the entire world. International experience shows to be one of the best ways to teach at the present conditions once mobility is higher, communications are easy and accessible for the majority of the world population [01].

Education without any doubt is a science in constant construction like any area of men's life: dynamic, challenging and alive. However one question still remains after all the discussions and changes in education field worldwide: how to form the best professional? As the answers have been so many that it is difficult to say it is this or that. Many Institutions of Education have been seeking for the best ways to provide high level education goes their society worldwide.

Anyhow the quality of the Institutions of Education implies several aspects such as the: quality of classrooms, labs, libraries, communication systems etc; students ' services, qualification of human resources; pedagogical scientific quality, credibility as a good institution. Good programs have good motivated teachers in addition to modern installations and dynamic planning. The Faculty of any Institution of Education is one of the most important element, which provides or not its qualification of excellence [02].

In order to fulfill a lack of engineering educators for high education for engineering and technological fields in the country COPEC - Council of Researches in Education and Sciences education team has designed a new program in graduation level: the Port Engineering Program. The goal is to improve the formation of the civil engineer providing them with all the competencies needed to perform at the state of the art with the best available technologies.

The so called PEP Program offers two graduate degrees: the Master of Science and the Doctor of Philosophy and it is a very dynamic and rich program, developed in modules, followed in several countries in the world. It follows the trend of global formation of professionals, mainly to attend the need of a prepared professional to perform in the port work market with a graduation level formation [03].

2. Globalization and Education

Along the History it can be seen the human achievements in altering and dominating nature in favor of better ways of surviving. This is how technology was born and prevails improving and now more than ever in much sophisticated levels. Men can now more than ever reach levels of comfort, healing of diseases, increasing age level expectations, moving around the world, watching the news and communicate in real time.

All this thanks to the development of sciences and technology and engineers all over the world are in many ways shaping a new life style, helping to save lives, making transportation faster and more secure, enhancing communications and etc. This isolated aspect – the development of sciences and technology, helped to make the globalization phenomenon a reality once more in human history. In the past Alexander the Great was may be the first leader to promote the globalization through wars and invasions followed by Genghis Khan, Cesar and others. Now the big corporations are promoting the globalization in a more subtle way, may be less painful and traumatic but still invasive. If it is good or bad the future will tell us, there are pros and cons being widely discussed but the fact is that it is there. It is the evolution of the capitalism system predominant in the world and sciences are occupying its place of relevance in world scenario [04].

One positive aspect of present world is that the nation’s world wide is recognizing the importance of engineers once they are the ones that make possible the world goes round.

In academic midst the discussions about the formation of engineers are receiving more and more incentive and many real actions have been applied with success. Many new engineering programs have been conceived and are working well, more flexible programs, more investments in labs and equipments, more exchanges programs and so on. It is the education evolution in

order to adequate the formation of engineers for the future. So Future is the keyword once the world is changing so fast as well as the labor market.

The Universities and their Schools and Institutes have been sacrificed by the so called globalization that imposes certain needs that are absolutely new and many of them not so necessary. It is no longer a matter of using multimedia equipment in classroom but fundamentally to look for new more appropriate and captivating contents to present to the new plugged students. Besides all of the technical and pedagogic aspects it is necessary to think about the psychological aspects of this great and passionate process of teaching. For the good or for the evil, there it is this new socioeconomic and political world of contrasts in which only the education can really change for better [05].

Speaking about education for best, the professionals who leave the universities today leave already with a stock of knowledge that is partly obsolete and s/he has to run fast to adapt to the new job market. Is this the fault of the University? The answer is no, the University has been serving the society for centuries and without interests others than the investigation and the improvement of the knowledge that generates benefits for the humanity as a whole.

3. Discussions about Globalization

Globalization could be defined as the transformation of the world in a global village, that means “closer contact between different parts of the world, with increasing possibilities of personal exchange, mutual understanding and friendship between "world citizens", and creation of a global civilization.” Nevertheless analyzing Globalization on the economical-financial side it began in the 80’s with the integration at world level of the economical and financial relationships. It presents two aspects: the negative and the positive.

As positive aspect is the cultural and commercial exchange among people and nations; in the course of two generations the gap between the industrial and the developing regions narrowed substantially everywhere; the overall poverty, when defined by health of population and life expectancy, as well as by income has diminished [06]. By the other hand the results of globalization have not been what was predicted when the attempt to increase free trade began, and many institutions involved in the system of globalization have not taken the interests of poorer nations, the working class, and the environment into account; developed countries are the largest beneficiaries of this system and they are becoming richer while the developing countries are becoming poorer.

The discussions about Globalization in general show a bad scenario and the future is unpredictable once it is not possible to foreseen the big players’ next movement in such huge business game of fighting for markets.

4. Science and Technology in global world

Scientists for centuries can see the world as a unified heterogenic content and capable to comprehend the whole. In a sense, science is responsible for the idea of globalization.

Furthermore, as a system of knowledge, science has been uniquely successful at building widely shared understandings that transcend political and cultural differences.

Information Technology known as IT is a driving factor in the process of globalization. Improvements in the early 1990s in computer hardware, software, and telecommunications have caused widespread improvements in access to information and economic potential. These advances have facilitated efficiency gains in all sectors of the economy. IT provides the communication network that facilitates the expansion of products, ideas, and resources among nations and among people regardless of geographic location. Creating efficient and effective channels to exchange information, IT has been the catalyst for global integration [07].

5. Discussions about the Work Market

Science and technology innovations have shaped the present work market in such a way that from now on "changing" is the role and not the exception. It is a changing world and a changing work market in every level. Technology has enhanced work place that means less hand work and more mental work. Thanks to information technology the workplace is now team-based. Management styles have changed with horizontal structures where everybody is responsible for the results of the work requiring less supervision. For workers in any level the expected profile comprehend attitudes and behaviors to work in teams. The job environment is different due to the way that companies run the busyness now; jobs positions are displaced, others take places and shifts are always changing in according to the new necessities.

Among the dramatic changes in work market it is noticed that now more jobs are part time; more people are self employed; less staff needed to accomplish works; paid and unpaid overtime work are increasing; global competitiveness; flatter organizational structures; companies downsizing, less job security [08].

Human beings are living now in a changing work environment full of surprises and unpredictable events in a daily basis. The best way to overcome and to survive is to be prepared achieving knowledge and be willing to develop new skills.

6. Next generation of engineers

The global expansion is here to stay.

Advanced communications technologies continue to alter the way businesses and societies conduct themselves and interact with each other. Today's engineers are expected to work globally-collaborating with team members located in various countries with diverse languages and business cultures to engineer products and services that insure the company's competitiveness in the global economy.

How best to educate the next generation of scientists and engineers, who will enter a workplace that has become truly global environment?

There is not only one answer and the point is that the engineering schools are the ones responsible for the formation of generations of engineers who are among others the main responsible for the development of sciences and technology seeking for the betterment of humanity.

Despite the negative aspects of globalization all the scientific and technological advancements have one main goal: make men's life better. That is why machines were designed to do the hard work so that men can have more time for other more pleasant work; the search for new drugs to defeat diseases, to live better and more and so on. Nevertheless all the achievements bring also new situations that are not always positive that is why engineers should to be more aware of social responsibility, to be aware not only about the economic and environmental issues but also the impact of new technologies in the society. Any isolated event in the current world in one or another way has some effect in other regions of the planet and sooner or later they will be felt. To deny it is the same as to "sweep the dust under the carpet" [09].

So, summarizing the formation of the engineer for the future must consider besides the strong basis in basic sciences and basic sciences of engineering the development of:

- Communication skills;
- The willing to learn all life;
- Positive attitudes and behaviors;
- To work in teams;
- Responsibility for actions and results;
- Respect to diversity;
- Entrepreneurship;
- Self employability;
- Self management.

May be the main skill is the development of the capacity to see the opportunity of a new work, a niche that can be explored and generate good results no matter where it is. The learning of languages and the sensitiveness to behave properly are some of the skills necessary for the new work market [10].

7. The New Professional

In this new world scenario the skills, knowledge and training that are required are fundamental to survive in the changing labor market. It is imperative to be able to manage technological changes, be creative, take calculated risks, manage stress, think conceptually and recognize and respect people's diversity and individual differences.

The knowledge required includes the general knowledge of the busyness, the understanding of the total organization, at least a general knowledge about computers among others. The academic knowledge must provide the basic foundation to get, keep, and progress on a job to achieve the best results.

Companies in general are requiring professionals with some knowledge about specific engineering specialty. The Sea port of town is not different and the engineers hired by them in general had to go to Sao Paulo city for a program similar to this. The importance of the graduation program proposed is that it has been planned taking into account the specific needs of the port.

8. The Port Engineering Program Information

The Master Degree in Port Engineering requires 30 credits in ECT's of graduate studies. The 30 credits consist of a minimum of 12 credit hours of coursework, plus 12 credit hours of any combination of coursework, independent study, directed research or thesis that complies with the following constraints: if there is a thesis, it must at least 6 and no more than 12 credits; there can be no more than 9 credits of directed research; and the total number of credits from the Management Department cannot exceed 14 [11].

The minimum of 12 credit hours of coursework must include a minimum of two credits each in at least four of the seven core areas. The coursework should be selected in consultation with an advisor from the PE faculty. All full-time students are required to participate in the non-credit seminar course [12].

The program provides advance instruction in the various disciplines associated with maritime ports and ocean and inland waterway transportation systems. This instruction is delivered in a framework that encourages the use of technology to address the social, environmental, and economic issues related to maritime systems. Each student will meet with his/her faculty advisor to devise a study plan that matches the student's background, experience and interests while also satisfying the formal coursework requirements for the master's degree.

9. Admission Requirements

The basic candidate requirement for admission is [13]:

To have a bachelor's degree in civil engineering, however the program encourages applicants from diverse backgrounds, including (but not limited to) engineering, ocean sciences, environmental science, and management. Applicants may need to complete prerequisite courses. A faculty advisor will determine the specific requirements on an individual basis depending on the student's educational background and work experience.

10. Candidate Profile

- Taste for related themes to the sciences of mathematics and physics and technological ones of civil engineering.
- Interest in solving problems in engineering in coastal and estuary environment principally the ones that involves the coast and constructions.
- Capability of questioning.
- Affinity and discipline for the activity of research.

11. Developed skills and Competences along the program

- Knowledge of physics and mathematics;
- Knowledge of civil engineering such as civil construction, fluid mechanics, hydraulic and sanitation;
- Knowledge of waves, tides and maritime currents;
- Knowledge of ports and systems of water transportation;
- Knowledge of dynamic of sediments at the coastal and estuary zone;
- Knowledge about constructions in marine environment;
- Knowledge about ports and transport systems in waters;
- Some Knowledge about instrumental application for measurement of waves, tides, currents, transport and sediments and geotechnical;
- Ability to analyze and interpret information;
- Computing abilities.

12. The Professional

The professional receives the title of Master in Port Engineering.

13. Program Content

- Basic dimensions of the water transport and improvement works for the navigation;
- Coastal processes;
- Dimensions of channels and port basins;
- Dredging - Studies of complete cases and the involved environmental subjects;
- Dredging and overthrow;
- Estuary works and underwater emissaries;
- Examples of consolidated water transport ways;
- Fluvial morphology;
- Fluvial transport of sediments;
- Foundations on port load concentrator and coastal traffic;
- Hydraulics Estuary;
- Hydrodynamic of waves;
- Internal port works;
- Normalization works and regularization of the rivers;
- Organization, administration and port operation;
- Port general arrangement;
- Port shelter works;
- Tides and currents;
- Water transportation and the Coastal Management in Brazil;
- Works of defense of the coasts;
- Dams and capacity of traffic in water transportation flows.

14. Conclusion

It is a reasonably flexible program that has been designed in order to lead the attendees to think "out of the box" imprinting the notion of dynamic teaching environment that is necessary in order to form the new professional. It has been designed for professionals interested in the improvement of career and quality performance.

The evaluations of the courses have been very positive. The attendees are satisfied with the approach and the content of the courses.

It consists in a great achievement for engineering midst once it can provide for engineers and interested professionals the opportunity to update and achieve the knowledge about the port engineering and at the same time to fulfill the lack of professionals for this field of action.

The number of professionals interested in the program is growing and it is expected a larger number of attendees for next years. Not only because it fits to the needs of the sea port of town but also because it is a new program that promises once the historical political moment of the city requires qualified professionals in this field.

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