

COURSE ON PRODUCTION ENGINEERING WITH TECHNOLOGICAL BASE MECHATRONIC

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Abstract

This work presents the project of an innovative course of Production Engineering with technological base in mechatronic for the Centro Federal Educação Tecnológica Celso Suckow da Fonseca (Federal Center Technological Education Celso Suckow of Fonseca) CEFET/RJ–State of Rio de Janeiro - Brazil, aiming at preparing a professional suited to the needs of the XXI century. With the purpose of graduating professionals with technological profile, CEFET/RJ proposes the course with the goal of majoring professionals more adapted to the understanding of the shifts promoted by the automation and by applying Robotics in industrial processes, that assists the matter of the vertical profile of teaching in the Institution.

Keywords: mechatronic, production engineering, education engineering

1. Introduction

Social, economic and technological changes are happening in short period of time comparing to the past. The Engineering Schools face each other in the task of rethinking their curricula, incorporating knowledge that enable their students to exercise the skill in a successfully way for them and the society. The current areas of the Engineering Course are being debated on the present curricula, the contents requested by the demands of the scientific and technological development. In some cases, however, the subjects of the course, in function of the wide range of the area of the professional's performance, allows increments, aiming at the creation of new areas of work.

The development of the technology and new productive processes and its adaptation to the reality of the situation of the several phases of the humanity's economic and social evolution. Among the several evolutionary stages of the development of the productive systems can stand out the Industrial Revolution and the coming of the Computer Science.

The Production Engineering links unequivocally with the production of goods and services. In a simple way, its performance

limits to the form transformations and content of a generic material through the incorporation of the human work. Therefore in order to have production one should make an interactive process among men, materials and equipments. The work can be defined as the interaction of resources in time and space, resulting alteration in form or position of some or of all the resources, in agreement with pre-settled objectives.

In spite of the fact of the practice of the Production Engineering is previous than the Industrial Revolution the latter achievement with the creation of the systems integrating man, materials and equipments, stressed the application of its methods.

Unlike the other branches of the Engineering, the Production Engineering isn't associated in particular, to any productive section, once its field of performance is extremely vast. In concept, the performance of the Production Engineering can be appreciated in any situations of work where there are problems with the efficient use of human resources and materials. Thus, the Production Engineering embraces all the fields of resources where it is requested planning, coordination and control so that the productive resources - men, equipments and materials – are being rationally used.

Among all the branches of the Engineering, the one of the Production is the most recent, in Brazil as in the abroad. In this country, it arrived over than thirty years and internationally, is recognized in its first century. It stands for a characteristic that distinguishes from other branches of the Engineering. Based upon discussions in encounters and seminars the scope of its area of performance, the philosophical concept on its social role and its interdependence curricular with other areas of the sciences, it seems that they aren't established yet with the property requested by the professionals of the branch in Brazil.

However, even the current courses of Production Engineering are being questioned about the real adaptation of their curricula to

the engineer's own mission. In fact, it is observed that these courses are much more focus on an economy support and social sciences of the organization. Thus, the technological aspects continue being relegated in the professional's graduation that limits the potential of the companies, since the technical knowledge of the processes is involved in the production of the final products and it is factor of primordial importance for the correction of the managerial decisions.

This change of directions of the Production Engineering in the universities, besides propitiating an overlap with curricula of the courses of industrial administration, generated a gap in the professionals' graduation with profile adapted to the attendance of the demands, justifying significant reforms in the professional profiles be formed.

2. Proposed Model

The trend of reducing the life cycle of products and processes, with changes in the way of productive organization, as well as that of work relations, are demanding the capacity of processing scientific and technological information beyond the scope of engineering. The concept of simultaneous engineering synthesizes the necessary flexibility for the professional's profile who develops and purchases products with technological contents originating from of several specialty areas. Taking as example, the patent US4723129, about jet printers most mentioned in the North American of patents database between 1985 and 1995 (272 citations), which encompasses simultaneously the most recent advances in several fields as mechanical engineering, chemical, chemistry, electronics and production engineering.

Some of these technological tendencies are global, with impacts upon today's profile of Brazilian engineers and are being discussed in several forums, about the resolution 48/76 (minimum curriculum) from Education and Culture Ministry. Nowadays, this situation in Brazil can also be observed by the search of professionals courses including linked to the management process, highlighting the Engineering of Production in opposition with to the conventional courses of Engineering with specific areas, except some as those of Telecommunications.

At the same time, it is observed that companies that get a share in the highly competitive world market, are those which show a high degree of technological development of manufacturing, technical innovators and modern commercialization strategies and distribution. Aforementioned factors are always associated to the mechatronic.

Mechatronic, a coined term of Japanese, can be defined as the group of fundamentals, procedures and technique for the service, production and development of machines oriented towards future, means and facilities. Therefore, the mechatronic is a technical

interdisciplinary discipline with base on the electrical, electronical and mechanical engineering, that cannot just be considered as the connection among the mentioned areas but, also, between them and the computer and software engineering. Its central focus is the integration of development of systems of technical components "mecha", controlled by intelligent systems "tronic."

A mechatronic system is composed by electrical and mechanical, put upon parts the sensor ones, that record information and with microprocessors, which interpret, process and analyze the information, which then react upon this the information, thus becomes a complete mechatronic system. The terminology "Mechatronic" has existed since 1980 in Japan, seemingly defined by an employee of the company Yasukanda Company. But the current group of disciplines and ideas that it composes, are not new. In the aerospace industry, for example, they exist and they make success for a good time. The development of economical computational power and of the intelligence power electronics is the main reason that this interdisciplinary point views has been used for the development of new products outside the scope of aerospace. A range of examples might include automatic video cameras, CD player, of modern photo copier, the user friendly of the machine of washing Fuzzy-logic, with engine emissions of sensors and computer controlled by injection. Upon further investigation of those examples, one finds discovered that the mutual penetration of these sciences in industrial applications doesn't about bring only improvement in the products, but leads for completely solutions. But it would be false to believe that mechatronic is only for products of high technology. The mechatronic solutions to the problems are discovered throughout the great reach of the fields of the engineering.

2. Course Organization

The course is organized with five years of length. In the first years the course will be mainly formed by obligatory, annual or one semester disciplines registration according to its nature. On the contrary, in the last years, the disciplines can be elective and half-yearly preponderantly favoring the establishment of different emphases inside of each branch.

During the fifth year, the student should develop a final course project work. This work has the purpose of allowing the student to deepen professional knowledge in certain activity area and, at the same time, gain some experience of the character multidisciplinary of the profession. CEFET/RJ should promote the necessary ways for the accomplishment of that work and each department will establish the requirements that the students will fulfill for achieving the degree.

3.1 Didactic load

The didactic load was established in agreement with the exposed following premises:

- to balance the content of the disciplines, so the students can learn what is in fact demanded from them;
- to decrease the number of hours in classroom and to increase the number of hours of study significantly out of class. Though, it is indispensable that the student easily can find teachers that are out available for the support installment to its study of the classroom. Besides, it is necessary to control the result of that study accomplished out of the classroom indeed;
- to establish a coordination system that hinders the demand of exaggerated volume of tasks from the students;
- CEFET/RJ's student should dedicate, in the group of activities, at least 48 hours a week to engineer's graduation;
- there will be at the most 28 weekly hours of class, being included the classes of lectures, exercises, seminars and in laboratories;
- the school semesters should have minimum duration of 15 effective weeks of class, besides occasionally weeks of interruption of studies and of dedicated weeks for exams.

3.2. Evaluation of knowledge

The process of evaluation of the student's learning will be made through evaluations along the discipline and exam performed at the end of the discipline. The periods of tests and exams will respect the necessary periods to the maturation of the knowledge acquired by the students.

3.3 Professional Cycle

Inside of each one of the different branches, the third and fourth years will be mainly composed by disciplines common and obligatory. In this phase one doesn't think him in significant specialization inside of each branch, although it can already have flexibility for the direction of emphases at the end of the course.

In the fifth year the disciplines will be elective preponderantly, formed by different modules organized coherently and completed by the final course project.

With this organization, the content of the third and fourth years will allow to give to the course quite conceptual and stable character, that it will be complemented, in the fifth year, for great freedom in the plan of the directions of the students' graduation, in function of the developments of the technology.

3.4 Formation, Qualification and Control of the faculty

The goals of proposals for the year 2000 will demand highly qualified faculty and dedicated to the teaching. Incentives and means will be created like this for the

educational doctorate of the current ones. Among these means should prevail the equipment or reequipment of research laboratories in all the departments. Besides, preference will be given to grant a doctorate it in the opening of new vacancies of educational.

4. Professional's Profile

The Course of Production Mechatronic Engineering has the objective to graduate capable engineers:

- To develop and to implant projects that use junction of the mechanics, electrical and computer engineering;
- To perform researches in this interdisciplinary field;
- To act in new work fields, due to the character multidisciplinary of its formation;
- To understand and to manage properly inside of the organic structure of a production system;
- To act preventively in the stages of the productive process providing its permanent technological and social modernization in order to maintain high standarts of its productivity and efficiency.

5. Conclusions and Recommendations

The Brazilian market sends us to the universal tendency of planning graduation courses, whose basic characteristics are founded in the demand of more accurate courses, generic and reduced schedule, leaving graduated by CEFET/RJ for continuous education. Possibly the recently graduated production engineer won't possess the whole knowledge that will use in its professional career. However, a solid understanding of fundamentals and a vision of continuous improvement make that the ignorance becomes something challenging and pleasant of confronting.

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