# DISTANCE LEARNING CHALLENGING PRESENT COMPUTER ENGINEERING PROGRAM

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**Abstract** — *This work shows one proposal that is basically the adoption of an online course in the curriculum of one of a traditional Computer Engineering Course of under graduation level. The course is Digital Systems and with its success another course may be introduced, the Communication Systems. It is a very simple process where the students have available the course with all the synchronous and asynchronous tools existent in the Institution. Through Internet it is possible to access the whole content of the course in individual modules and in sequence. The modules count with introductory elements, theory, and development through examples, interactive simulations and exercises. In a large country like Brazil, Distance Learning, is not only leaning as an alternative for the traditional teaching, but principally, as a need to provide quality education for a growing demand in a land geographically disperse.*

*Index Terms* — *Asynchronous, modules, synchronous, team work, tutorial, web-based education.*

## INTRODUCTION

At under graduation level, distance learning faces some problems of partner-cultural character that represent obstacles more difficulties to be overcome. Educational and pedagogic models consecrated in Brazilian universities, above all in the private institutions of superior education, suffer a strong influence of the secondary school teaching way that education is centered in teacher's illustration and the pedagogic model is based on the European model of the century XIX, which is basically established on present and expositive classes. This reality is constantly fed by the academic-administrative structure that approaches of the secondary reality with graduation courses offered all together in blocks, or packages, with little or any academic mobility, that should be the gist of the university academy.

However, such reality has been modified and the Distance Education cannot and it should have preponderant role in the transformation for a modern educational paradigm.

This work consists in the description of an innovative engineering education approach, which is basically the introduction in a traditional engineering program of one course a hundred percent taught remotely.

## OTHER ALTERNATIVE TO INCREMENT ENGINEERING EDUCATION

The proposal consists in the insertion, in a first moment, of Digital Systems course taught remotely and later with the introduction of Communication Systems course [1-3] in a Computer Engineering Program totally ministered in a traditional way They are both a hundred percent at distance, with practically a hundred percent of their content ministered remotely too [4].

For such, the content of the course has been adapted to be showed in individual modules, settling down among them a logical-progressive sequence or based on punctual subjects (topics).

The content of the existent Engineering Programs count with the following content, (basically) [5]:

- Important Preliminary Concepts: general aspects of the chronology of communication systems;
- Theory notions of the information: definition of Information, Message, and Sign;
- Communication Channels: phone channel, optic fiber, satellite, channel capacity, general vision of the systems of analogical communications and type;
- Usual Definitions of band width; concept of Basic Band; types of Communications Channels;
- Technical of Transmission of Analogical Signs for Analogical Carriers: General vision of the Modulation Systems in Width, Angle and Phase, Modulation AM;
- Ghastly Effects of Modulation AM; Temporary effects of the Modulation AM; Percentage of Modulation: Positive, Negative and Total; Efficiency of Modulation;
- The Problem of Over modulation; Modulation SSB and VSB; Modulation in Angle: in phase and in frequency;
- Concept of Lineal Modulation;
- Considerations about Distribution of Potency in the Spectrum of a Signal FM: Functions of Bessel; The rule of Carson; Graphic form of visualization of the difference between AM and FM; Comparison between AM and FM; More important methods of Generation and Detection FM: PLL, FM Stereo;
- Basic Beginnings of Antennas: Polarization, Diagrams of Radiation; Gain; Resistance of Radiation; Width of Bunch;

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- Introduction to the Usual Systems Communications: the. Phone Systems: The Evolution of the Telephone; Beginning of Operation;
- Telephones Cellular: main concepts; PX, PAX, PBX, PABX; Phone calls Local/Trunk; notions of cellular telephony b;
- Systems of Television: Initial concepts: square, Field, Persistence and Gleam, Resolution; The sign of Composed Video: synchronism H and V; equalization; Correction Gamma; Diagram in blocks of a TVC. General vision of NTSC, PAL Systems and EVAPORATE;
- Important initial concepts in digital transmission: synchronism types; acting calculation; systems CDMA4 - Communication for optic fibers;
- Types of fibers; propagation manners; characteristics of Transmission; examples of systems;
- Systems of Communication through Satellite Systems geostationary and of lower orbit;
- Transponder; Receiving stations; examples of connections;
- Basic Beginnings of Television Digital Differences of the analogical system; the digital code of the sign of Composed video. Diagram of the receiver; examples of systems;
- Codes brokers block Codes, recurrent and convolutions; interlacing; comparison of acting of coded systems and not coded;
- Notions of Digital Processing of Signs digital Sequences; transformed Z, decimation and interpolation; digital filters;
- Study of the Transformed of Fourier and its properties: linearity, areas in the domains t and f, duality, scale changes in t and f, translations in t and f, differentiation and integration, convolutions, correlation in the time and energy, ghastly density of energy. Functions of crossed correlation and of self-correlation for potency signs, ghastly density of potency, calculation examples;
- Behavior asymptotic of pulses. Pass-low filters without distortion. Representations of signs pass-strip, for components in squaring and for width-and-phase, wrapper; filters pass-strip without distortion. Relationship among them transformed of Laplace and of Fourier;
- Modulation: need to modulate and modulation types. Lineal or amplitude modulation. AM detection for wrapper. Modulators and detecting;
- Effects of synchronism lack. VSB, filters vestiges. Descriptions of TV system white-and-black and color. Examples of use of DSB and SSB;
- Exponential Modulation: FM and PM. Busy bands; tonal modulation, with one and two tones, spectra, phasor diagrams;
- Effects of no-linearity; generation methods and detection of FM. Analysis of PLL. Interference effects in the modulations AM, FM and PM; comparisons;
- Effect of the message spectrum;

- Representations of strip noise narrows: for components in squaring and wrapper-and-phase;
- Noise Effects in the lineal modulation; effect threshold;
- Noise in the exponential modulation. Effect threshold in FM; extension of the threshold.

And its basic and complementary Bibliography is the following elements:

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## PROGRAM PECULIARITIES

In order to accomplish the effective implementation of this distance-learning course the students have all the existent computational tool of the Institution (Teleconference, Chat, e-mail, etc.) available, besides a tutorial through the page of the course in the link of the course in the portal of the Institution.

Through Internet, interactive examples and simulations have been showing as powerful tools for the teaching of the Communication Systems course. The sequence of the course is showed through modules that count with introductory elements, theory, development through examples, interactive simulations and exercises for delivery (everything available on-line and off-line through "downloads" and e-mail).

The software has been conceived in Java language. The students of the Communication Systems should create their own links associated to the main Link of the Computer Engineering Department.

To concept its sites studies begins in-group with the aid of monitors of Computer course of Computer Sciences Program using basic tools as Microsoft Front Page Express that is an editor in HTML language. The easiness of the use of its resources and the tutorial of the package allows a fast

development of the students to the step that they get familiarized with the tools of Distance Learning.

Starting from certain point, after an evaluation it is very possible, to abolish the presence in class room, just limiting to monthly encounters with the monitors and teachers of the course for the evaluation and a correct feedback of the program [6].

Tutorial counts with synchronous and asynchronous resources offers the opportunity, so much for the monitors' students (of advanced years of the course) as for the students of the course. The subjects guided by the students of the course are under responsibility of the monitors, so that when they have to face subjects that are besides their knowledge, they go to the responsible teacher of the course that monitors and supervises the whole change of information [7-9].

Meetings that can be scheduled and/or sporadic are then combined among monitors, students and the teacher of the discipline, in order to accompany the pedagogic progress of the experience, once it not only a change of the communication means, but it is about a whole paradigm change, accompanied, evidently for the respective psycho-pedagogic impacts [10].

Table 1: Examples of the modules of teaching at Distance of the Communication Systems course, time of duration and used Electronic Means.

| Subject of the module | Time foreseen | Exercises | Computer Tools. |
|---|---|---|---|
| Notions of theory of the information | 2h30min | 5 for delivery | Internet Explorer, Acrobat Reader, Outlook Express |
| Convolutions | 2h30min | 10 on line | Internet Explorer, Acrobat Reader, Outlook Express e Chat |
| Discussion | 50 min | - | Chat |
| Need to modulate and types of modulation | 2h30min | 5 for delivery | Internet Explorer, Acrobat Reader, Outlook Express |
| Noise in the exponential modulation | 2h30min | - | Teleconference |
| Discussion | 50min | - | Chat |

Communication Systems modules of the course (table 1, shows some examples of modules), have been divided so that it is possible the necessary time for the approach of the subject, completely, and it can't exceed week time determined for the hourly load of the course.

Inside of the program of availability of the modules of the course have made use of Hypermedia, with the support of videos, tables, photos and some simulations as support to the theory.

Tutorial indicates it is a powerful tool in the elimination of doubts, not only in the use of the software, as well as for the resolution of the own suggested problems, through links of help.

Electronic mail shows to be the most used electronic way to remove doubts as well as for the shipping of answers of the proposed problems.

Monitors team interfaces the communication between the educational of the course and the students, in the resolution of proposed problems and also in the elimination of doubts, having, however, the educational supervision in all the correspondents communications and received through the protocols generated at once of the shipping and of the greeting of the correspondences [11].

Evaluation of academic use can be made in presence classes with the application of individual tests and in-group tends. The score can be pondered by the remote participation of the students in case of a smooth implementation to avoid radical prejudice.

## FUTURE ACHIEVEMENTS

The proposal intends to increment with an evaluation totally remote instead of a written questionnaire filled in class. The goal is to make it more interesting for the students. [12-14].

Students should answer to questionnaire about Communication Systems course, in which they could express their opinions about the methodology and pedagogic aspects, as well as regarding the computational tools available in the Institution for this unusual experience of Distance Education in a personal program. Programmed meetings with the students and monitors are part of the implementation of this system they should happen once a month, with the objective of evaluating the progress and to motivate the academics to the self-discipline in the study remotely ministered. These scheduled assisted meetings should happen also with the purpose of illuminating persistent doubts and/or for the resolution of proposed problems of larger level of difficulty.

## CONCLUSION

This Innovative proposal is an opportunity to cultivate and grow the quality of engineer of this century.

The presented proposal is especially based in the modern paradigm that presupposes the need of a growing and incessant autonomy leading the student self-determination and responsibility in the construction of their knowledge. Some premises of the program are student commitment in dedicating certain number of week hours to study through diversified available computational tools.

The main preponderant factor that can be mentioned is that the psychological factor of "inhibition" doesn't exist with any physical presence, what propitiates a larger frankness in answering the questions and the possibility of more interactivity.

This proposal suggests a new " format " to the orthodox educational methods, since it presupposes the use of methodologies consecrated secularly, such as called them seminars, for example, with derivations and innovative aspects when inserting in this the whole available

technological tools in the institution, as well as the insert of more flexible and modernized concepts to the usual proposals. Collaboration between monitors and students shows to be a powerful way of helping students to be more effective learners and help staff to be more effective teachers.

The accomplishment of the project for now presented demands a great commitment of the faculty, once this, in educator's exercise, will provide a fomentation atmosphere to the research, motivating the necessary deep studies, as well as potentializing the kinetic aspect usually existent in academic groups.

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