Work in Progress - Integration of New Tools and Technologies in Electronics Teaching

Manuel A. Castro 1, Gabriel Diaz 2, Catalina Martinez Mediano 3 and Eugenio López Aldea 4

Abstract - Nowadays the methods to learn Electronics are changing, improving and adapting to new tools and possibilities that offer us new technologies like Internet. Simulation in electronics improves the activities in design of electronic circuits. Students can learn and design their own circuits. They can carry out, check, analyze and make their practices of the course in Electronics applying several simulators with computer. Languages like VHDL present us a new form of designing and simulating Digital Electronics like a description language. New forms of adapting distance education like multimedia courses in Internet, new educational platforms like IPSS_EE (Internet-based Performance System Support with Educational Elements) are configuring new methods of learning based in task instead of classic study’s methods. The DIEEC (Electrical and Computer Engineering Department) and MIDE (Methods of Investigation and Diagnosis in the Education) of UNED (Spanish University for Distance Education) in Spain are working to adapt all new methods and possibilities of electronics in learning and to evaluate the quality of the new methods.

INTRODUCTION
The present article tries to give a general vision of the possibilities and the impact that the new technologies have in electronics’ education. Is done by analyzing a new development curriculum where firstly the electronic systems are studied and the electronic components later, using simulation and Web based teaching. Finally, we expose multimedia environment and the educational platforms that take advantage of the new technologies to improve the quality of the education.

FROM SYSTEM TO ELEMENTS
The education of the general electronics normally begins with the description of the diverse electronic components which are semiconductors elements like diodes, transistors that are components of not linear behaviour, to go on with the study of the possible electronic systems composed by these studied components. At the same time, or before, according to the plan of study, there is studied the theory of circuits that helps to understand and calculate the behaviour of the same ones with linear components principally. It is possible to be deducing, therefore, their behaviour on having analyzed each of the components that they it form. It will appears here, new concepts that the electronic systems possess, as the amplification, noise, distortion, filtered, in short, a processing of the sign and their interferences for temperature or noise for electromagnetic interferences.

Part of our curriculum development is directed to the study of the electronic beginning first with the systems as black boxes, with their characteristics, intros, outs, powers, voltages and currents, frequencies, noise and distortion; in short, the whole behaviour without bearing in mind the implementation of the electronic system but we know how they work and what results are obtained by the diverse intros and distortion. This one creates the need to know its implementation and is here when it is begun by the study of the diverse electronic traditional components [1]. In the Figure 1 we can see an example of a power supply created, first, with black boxes.

Each one behaves of a certain form: transformation, rectification, filtered and regulation. The functioning is studied and later the physical element or electronic fundamental

1 Manuel A. Castro, Universidad Nacional de Educación a Distancia, mcastro@ieec.uned.es
2 Gabriel Diaz, Universidad Nacional de Educación a Distancia, gdiaz@ieec.uned.es
3 Catalina Martinez Mediano, Universidad Nacional de Educación a Distancia, cmarme@edu.uned.es
4 Eugenio López Aldea, Universidad Nacional de Educación a Distancia, elopez@ieec.uned.es

0-7803-8552-7/04/$20.00 © 2004 IEEE
October 20 – 23, 2004, Savannah, GA
34th ASEE/IEEE Frontiers in Education Conference
T1C-10
component that will realize the above mentioned behaviour. This curricular development that is realizing the DIEEC (Department of Electrical, Electronic and Control Engineering) of the UNED, [URL 1], integrates also all the steps: analysis, design, simulation and, finally, the manufacture with help of commercial catalogues that give physical sense to all the previous work and it offers the possibility of comparing the reality with the previous study. It knows, therefore, all the aspects of the procedure from design and manufacture of the circuits and electronic systems.

SIMULATION

The simulation in Electronics helps to the specialists to design the circuits improving their results, reducing costs and reducing the total time of the design. The simulation allows us to know the performance of a system without realizing the real experiment [2], [3], [4]. It is possible to design models with domain parameters, but you must know limitations of your model.

MULTIMEDIA EDUCATION

The change of the curriculum development from systems to elements and the integration of the simulation tools are two important aspects for the improvement of the quality in the education of the electronic. DIEEC works for the study and development of applications multimedia for the learning of the diverse matters of electronics and communications. Also we develop educational platforms like IPSS_EE together with the department MIDE of the UNED and the project PED-CARE, (European projects) that improve the interaction among the teacher and the pupil. It benefits fundamentally to the students where the need of the interaction becomes more notable in the distance studies. One of the applications in which we are working at present is the platform IPSS_EE (INTERNET-BASED SYSTEM SUPPORT WITH EDUCATIONAL ELEMENTS). It is based on the improvement of the knowledge by means of the education based on tasks and applying Internet as integration of the new technologies in the education. The Figure 2 shows a image of the course and tasks developed.

The environment of the task inside the application IPSS_EE counted on the possibility of sending an e-mail to the appropriate teacher and the sending of the solutions inside the application in different ways, Text, Text and File, Text and Web Site, File and finally Web Site. The course lasted one month. To the beginning of the same one a questionnaire was done to them to know their aptitudes in the field of the computers and when it finished two more questionnaires were realized in order to analyze the system and the tool IPSS_EE.

CONCLUSIONS

The rapid evolution of the computer tools makes unavoidable a new way of education. This form does not eliminate the classic one but it supports her to improve her quality. The learning to distance attracts strongly all the resources that improve the interactivity between the teacher, the matter and the pupil. The geographical distance loses increasingly sense with the utilization of these tools. Educational platforms across Internet, continues communication even mobile route, multimedia and possibility of improving and extending the contents in real time in these tools together with the possibility of creating expert systems of answers fed on the experiences of other courses are, among others, great possibilities that it is offered to the education. The new technologies in general can spread to any environment of learning, even in the labour world. The companies need to form to their personnel in the new methodologies of project development. To minimize the time of education improving his quality to obtain a better quality of the products translated into benefits there are two of the aims that the companies prosecute.

REFERENCES


URLs