

# Virtual tour in “Integrated Circuits Design” Laboratory

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## ABSTRACT

*Authors' motives leading to creation of a free access alternative source of information “Virtual tour in ‘Integrated Circuits Design’ Laboratory” are discussed in this article. The focus then turns towards the experience in design and realization of this virtual tour as a result of a close cooperation between teachers and students. This e-project is accessible at the following link <http://ec.elf.stuba.sk/wp1/> in Slovak and English languages.*

## 1. INTRODUCTION

Design and testing of analog, digital and mixed integrated circuits (ICs) belong to the most rapidly developing fields of contemporary electronics industry. ICs have this pre-eminent position because of their importance in building sophisticated integrated electronic solutions for a wide range of diverse applications such as computers, automotive, aerospace, cell-phones, digital cameras, electronic entertainment systems, medical equipment, environmental monitoring, etc.

Integrated Circuits Design (IC design) Laboratory at the Department of Microelectronics of Faculty of Electrical Engineering and Information Technology, Slovak University of Technology in Bratislava (FEI STU) deals mainly with design and testing of analog and digital circuits. It is the only laboratory of its kind in Slovakia. Substantial part of laboratory activities is focused on educational process: individual and team student projects and subjects of graduate and postgraduate study. The lab was established in 1992. Ever since, it has been active in the field of development, design and testing of various ICs in the frame-work of numerous successful research and education projects of national and international scale.

However, student’s interest in the IC design study is very little. Sometimes it does not even correspond to the demands in industrial domains. One of the reasons is that our university students, in the second year of their Bachelor study, have poor knowledge of what IC design is about and how useful all the skills gained in this field might be.

Therefore, in our motivation project, we had to concentrate on two basic problems:

How to help students to obtain basic knowledge about IC design?

How to motivate students for work in our Integrated Circuits Design Laboratory?

One of the ways how to deal with the issues mentioned above was to design an attractive user-friendly Virtual tour of our university “IC Design Laboratory” and make it freely accessible for everyone.

## 2. VIRTUAL TOUR CONTENT

Wikipedia defines a virtual tour as virtual reality simulation of an actually existing location [1]. To consider given requirements of a virtual tour, we decided to use the same open source software, the content management system WordPress, that was used for “Virtual tour in Semitec laboratory” [2].

The designed Virtual tour in “Integrated Circuits Design” Laboratory (further Virtual tour) deals with the virtual presentation of the laboratory focused on the explanation of relevant topics to a wide range of users, starting from ordinary public visitors to students searching for detailed technical information.

The Virtual tour is available on the webserver at the Department of Microelectronics at FEI STU at the following link <http://ec.elf.stuba.sk/wp1/> in Slovak and English language version.

The main addressed issues are: basic principle of different IC design methods and IC design workflow, significant published results, and information about teachers’ and students’ research achievements in the laboratory. The Virtual tour has been supplemented with four short videos and photo galleries of the laboratory for better student imagination of the workplace.

### A. Main menu of the Virtual tour

The main menu, showing on the right-hand side of Figure 1, is divided into two basic groups: Laboratory and IC design.

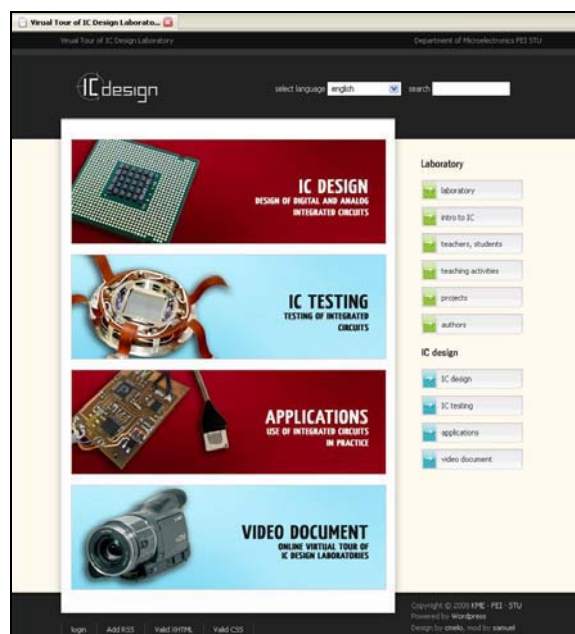


Figure 1 View on the main menu

### B. Laboratory

Group Laboratory includes the following six sections: ‘Laboratory’, ‘Introduction to ICs’, ‘Teachers & students’, ‘Teaching activities’, ‘Projects’ and ‘Authors’.

In the section ‘Laboratory’, visitors can find basic information about the laboratory, its short history, information about the faculty location, etc.

‘Intro to ICs’ offers the basic knowledge about integrated circuits. It consists of three parts: ‘How has it started?’, ‘Where are we now?’ and ‘Quo vadis IC?’ These sections inform about a brief history from the invention

of the first transistor, through Moore's Law, to future vision, such as a quantum consumer computer.

The sections 'Teachers & students', 'Teaching activities' and 'Projects' contain the basic information about researchers, teachers and students who work at the laboratory. In those sections, visitors can find the information about the current research topics, subjects, publications, topic and abstracts of students' diploma thesis, and also the results achieved by students within Student expert activities.

### C. IC design

Group IC design consists of four sections: IC design; IC testing; Applications; and Video documents.

The menu in body of the page (Figure 1) also enables direct access to these four sections of IC design group: 'IC DESIGN' – design of digital and analog integrated circuits; 'IC TESTING' – testing; 'APPLICATIONS' – example of some IC applications within research projects, and VIDEO DOCUMENT – online virtual tour of IC design laboratories.

The section 'IC design' introduces basic terms of Digital and Analog IC design. The page is illustrated with photographs taken specially for this purpose displaying design, prototype and layout of IC designed in the lab (see Figure 2).



Figure 2 Student view on section IC design

The section 'IC testing' deals with very important part of IC production, which is not always known to a non-specialist - IC testing. Description of four basic testing methods: Logical test, Current monitoring, Artificial neural network-based testing, and oscillation testing method are included.

'Applications' section is a very interesting part. It shows great possibilities of IC use in practice. The attention is focused on applications developed in research projects realized by our laboratory: 'Portable stress monitor' 'EduChip' – educational Chip DefSim (Defect Simulation), 'Artificial ear', 'Artificial amphiblastrodes', 'Robot – Pathfinder' - use neural networks in mobile robot motion.

The last section named 'Video document' (see Figure 3), shows the inside of our laboratory and its particular workplaces. Students can also see the workflow of an IC layout creation, a shot video of a robot-sleuth working, and an IC measurement equipment. This section is designated for the first contact for visitors and non-professionals.



Figure 3 Video document – Designers in action

This section was created to be a motivation mission.

Although a major part of this Virtual tour has been fully completed, there are segments which are still in the process of finalization. This is done very easily, because system WordPress enables very easy updates of materials.

### 3. CONCLUSION

The "Virtual tour in 'IC Design' Laboratory" was created in the cooperation of all the authors of this paper. It is the result of a particular subject called "Team Project" within the engineer graduate study at our university. The official main target of this subject is to develop teamwork skills (including a team player position, leadership, communication, etc.) and learn from the analysis of a change initiative in a virtual company.

We communicated together on regular basis, either in face-to-face meetings, by e-mail or by using the new created course "Team project 07-08" on the educational portal „eLearn central“ [3]. We used this internet course as a workspace for communication and for study materials sharing. Students and teachers had the same roles – editing teachers.

This virtual tour is accessible on the webserver of the Department of microelectronics. There is a free access to the site not only for students but for anyone interested.

We used new electronic form of visualization of experts' topic "Integrated Circuits Design". It has been realised in a popular way with the main aim to motivate students to work in such an interesting area, and also as a source of basic information about research and learning possibilities of our „IC Design Laboratory”.

### 4. ACKNOWLEDGMENT

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