# Technical University of Cluj-Napoca


**Design of VLSI Integrated Circuits**

Bases of Electronics Department

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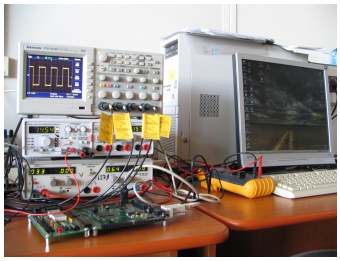

**Fig.1.** Testing an application on a FPGA development board

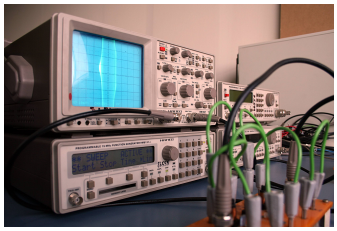

**Fig.2.** Analog measurement setup

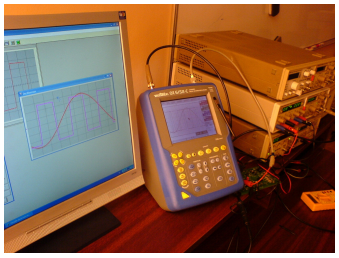

**Fig.3.** Computer aided testing and measurement setup

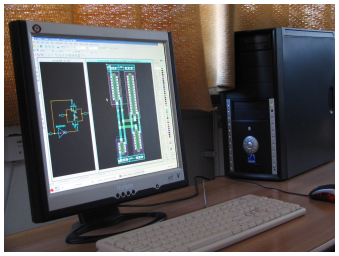

**Fig.4.** Linux workstation running Mentor Graphics ICStation

## Fields of Expertise

- Design methodologies of analog, digital and mixed-signal VLSI integrated circuits;
- Analysis, synthesis and design of current mode VLSI analog circuits;
- Evolutionary techniques in VLSI circuit design;
- Application development based on hardware description languages (Verilog, VHDL);
- Design and implementation of FPGA based digital applications;
- Computational intelligence in electronic circuit analysis, modelling and design;
- Applications of multivalued logic in electronic circuit analysis and design;
- Serial communication interface design;
- Integrated radio transceiver design.

## Research and Development Infrastructure

- The complete IC Nanometer Design package provided by Mentor Graphics, including all the required software tools for VLSI integrated circuit design and simulation based on modern CMOS and BiCMOS fabrication processes (ICStudio, Design Architect, Eldo, ICStation, ModelSim and a 90nm BiCMOS Technology Design Kit ).
- FPGA development boards: Digilent Basys, Digilent Nexys, and a Xilinx V2-Pro;
- Software resources: Xilinx ISE 8.2, Xilinx EDK 8.2, Chipscope Pro 8.2, Xilinx University Program nr. 5310-XUP-48961 dated 4/10/2006, Modelsim XE III 6.1
- Digilab development boards D2E-DIO1, provided by Digilent Inc., based on a Spartan IIE XC2S200E FPGAs; Digilab Spartan 3 development boards provided by Digilent Inc, based on Spartan 3, XC3S200 FPGAs; ispPAC10 - ispPAC30 development boards with built in analog reconfigurable circuits
- Measurement and testing setups, composed of a digital oscilloscope with computer interface, signal generator, voltage source, RLC measurement bridge, spectrum analyzer, digital multimeter and a personal computer.

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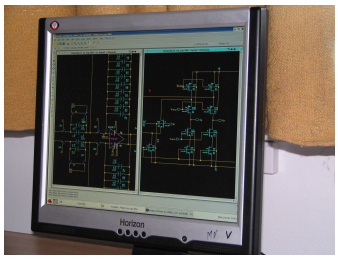

**Fig.5.** Linux workstation running Mentor Graphics Design Architect.

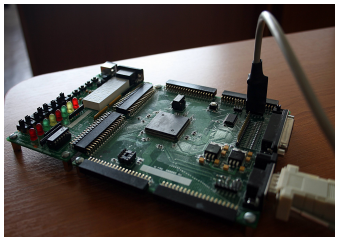

**Fig.6.** Digilent FPGA development board

**Fig.7.** Measurement and testing facilities within the laboratory

**Fig.8.** The VLSI integrated circuit design laboratory

## Facilities

The research team is built around experienced members of the department and also includes PhD students. The experience of the team members, along with the existing infrastructure, facilitates fundamental and applicative research, consultance and educational activities in the fields of expertise. On demand, the following tasks may be addressed:

- The synthesis of analog, digital and mixed signal integrated circuits down to layout level. The employed design environment is provided by Mentor Graphics Co;
- Implementation of digital signal processing solutions based on FPGA development;
- Measurement and testing of electronic circuits and systems

## Access to the lab facilities

The acces to the research facilities may be granted through the following:

- Services, research, consultance or educational projects and grants in colaboration between the Technical University of Cluj Napoca and industry parteners;
- Cooperation agreements with other educational and research institutions, domestic or abroad;
- Free access for students and researchers of the Technical University of Cluj Napoca.

## Research projects

- Cooperation agreement with Mentor Graphics Corp., providing licenses for the software tools and facilitating the development of research and educational programmes in our university, 2007
- “Development of a high speed support vector machine based system for the analysis and classification of images. Applications in real-time audio-visual speech recognition". CNCSIS project, 2005, Subject no. A22, CNCSIS code: 1044, Contract no. 34702 / 2005-2008
- "2.5D modelling of sound propagation in closed spaces and the improvement of room acustics through digital implementations", CNCSIS grant, ID 1057, 2007-2010
- "Analog modules in nanometer technologies and the development of functional models through fuzzy techniques", Ministry of Education and Research – 2005-2006;
- "Ultra-sensitive explosive detector" - DETEX, grant CERES PNCDI in cooperation with INCDTIM Cluj Napoca and UBB Cluj Napoca, 2003-2005;
- Third party research projects entitled *ASIC design for image processing applications***,** registration number 47/2006 ;
- Consultance project in cooperation with Sylansis Technologies, Ireland, entitled *Analog filter design for integrated OFLM receivers*.