SIEMENS

ACADEMIC

Carinthia University of Applied Sciences

Providing future microchip design engineers with holistic problem-solving skills

Products

PADS, Calibre, Catapult, Questa

Business challenges

Educate new generation of semiconductor engineers

Collaborate with industry to support technology exchange

Help students master increasing semiconductor complexity

Keys to success

Perform end-to-end microchip creation

Use Siemens EDA solutions for design verification

Leverage Catapult for high-level synthesis

Results

Provided future microchip design engineers with holistic problem-solving skills

Empowered future engineers to tackle the growing size and complexity of semiconductors

Produced custom mixed-signal integrated circuit

Fulfilled industry partners' requirements for future semiconductor experts

Carinthia University of Applied Sciences uses Siemens EDA to enable students to master complex semiconductor design

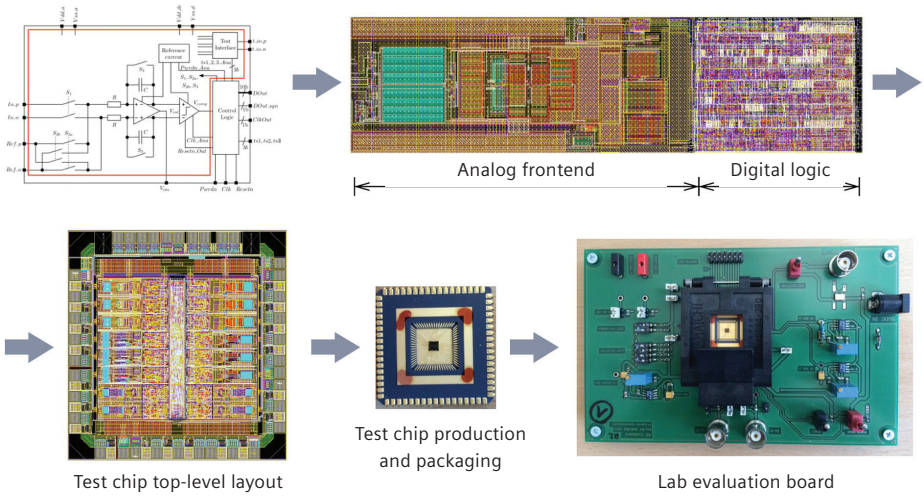
Learning to develop new technologies

Research and development (R&D) at Carinthia University of Applied Sciences (CUAS) makes an important contribution to transforming broad theoretical knowledge into practical applications. At its campuses in Feldkirchen, Klagenfurt, Spittal and Villach, Austria, CUAS provides its students with an international education in close cooperation with business and science disciplines that prepares them well for future challenges. From the first day of studies, it promotes problem-based learning with students applying the acquired knowledge in laboratories.

CUAS offers more than 30 degree courses in technology, healthcare and social studies as well as business studies. With its Center for Further Education, CUAS sets high scientific standards.

In a three-semester integrated circuit design project, students pursuing a master's degree in integrated systems and circuits design create their own mixed-signal integrated circuit from scratch.

Carinthia University of Applied Sciences' master's degree program in integrated systems and circuits design includes intensive theoretical and practical education for the modeling and design of integrated systems and circuits with a strong focus on analog and mixed-signal integrated circuits, system-on-chip design and system-in-package integration.



"Our students create their own integrated circuit, performing all the required steps from requirement specification to design and verification to prototype chip production and test. This makes them knowledgeable about all stages of IC design so they are less prone to fall into the traps."

Dr. Johannes Sturm
Head of Degree Program
Integrated Systems and Circuits Design
Carinthia University of Applied Sciences

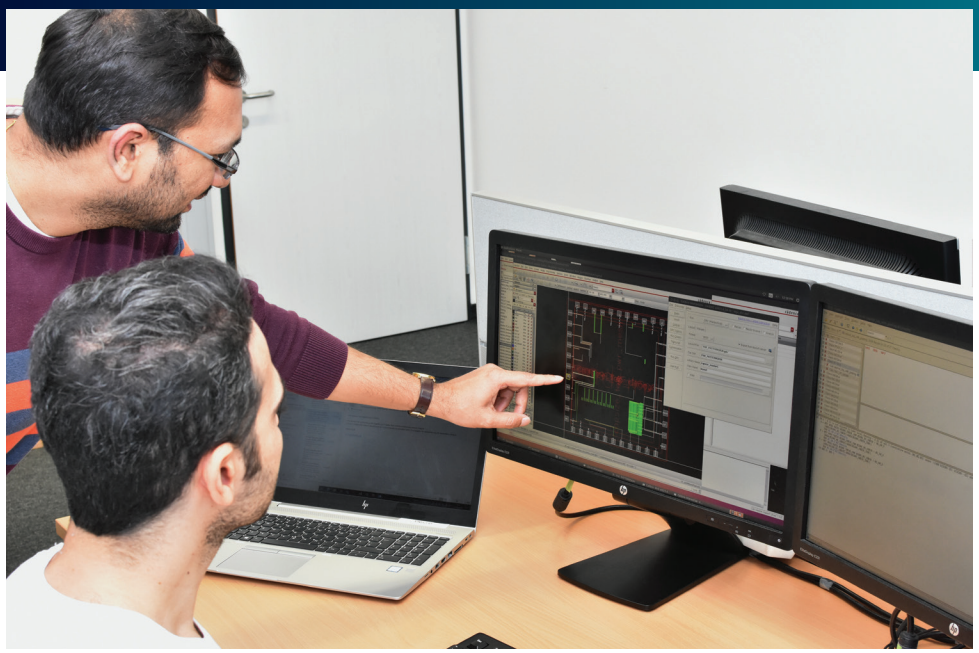
The CUAS faculty of Engineering and Information Technology partners with industry, business and society in the field of digitalization. The university is a member of the Silicon Alps Cluster. This public-private partnership brings together players from industry, research, academia and government to develop and position the Austrian electronics and microelectronics sector internationally with a regional focus on the federal states of Carinthia and Styria in the south of Austria.

During their systems engineering bachelor's degree program, CUAS students learn about applying system-oriented thinking as a key enabler of effective problem-solving and efficient product development. Using industrial equipment, they work in teams to solve problems, specifying, developing, manufacturing, evaluating, implementing and testing systems. The university has a strong focus on future-oriented technologies. Its research-related core competences include electronics and mechatronic systems, mechanical engineering and materials, information and communication technologies and technology management and hardware system integration.

Microchips for the future

For about five decades, integrated circuits (IC) have been the key technology for electronic systems in many application areas, ranging from data processing to telecommunications and automotive electronics. In the automotive domain, there has been amazing progress since the assembly of the first planar ICs with two transistors in the year 1961 to today's integrated processor components. Using very deep submicron (VDSM) fabrication technologies with structure sizes down to 5 nanometers (nm), they integrate several billion transistors on a single chip.

The overwhelming complexity of such solutions brings new challenges in the design of integrated systems and circuits. Among these are modeling on different levels of abstraction, system-level verification, low-power design, circuit design in new technologies, high-frequency circuits, intelligent solutions for power electronics and an increase in design efficiency. CUAS is among the few educational institutions in Europe to offer a master's degree in integrated systems and circuits design (ISCD). It provides the students with the necessary knowledge to master these challenges.



Using Siemens EDA solutions for design verification during the integrated systems and circuits design master's course makes it easier for CUAS students to master the rapidly increasing complexity of integrated circuitry.

The ISCD course includes intensive theoretical and practical education for the modeling and design of integrated systems and circuits. There is a strong focus on analog and mixed-signal integrated circuits for sensor frontends and system-on-chip (SoC) design and system-in-package (SiP) integration. It includes detailed computer-aided design (CAD) modeling and simulation training. This is supplemented with courses on analog-to-digital (AD) and digital-to-analog DA converters, power electronics, microelectromechanical systems (MEMS), radio frequency (RF) circuits, sensors, system-on-a-chip and digital signal processing (DSP).

What makes ISCD unique among master's programs worldwide is that training and laboratory work on technology and design methodology, transistor-level circuit design and modeling and systems solution is supported by a three-semester IC design project.

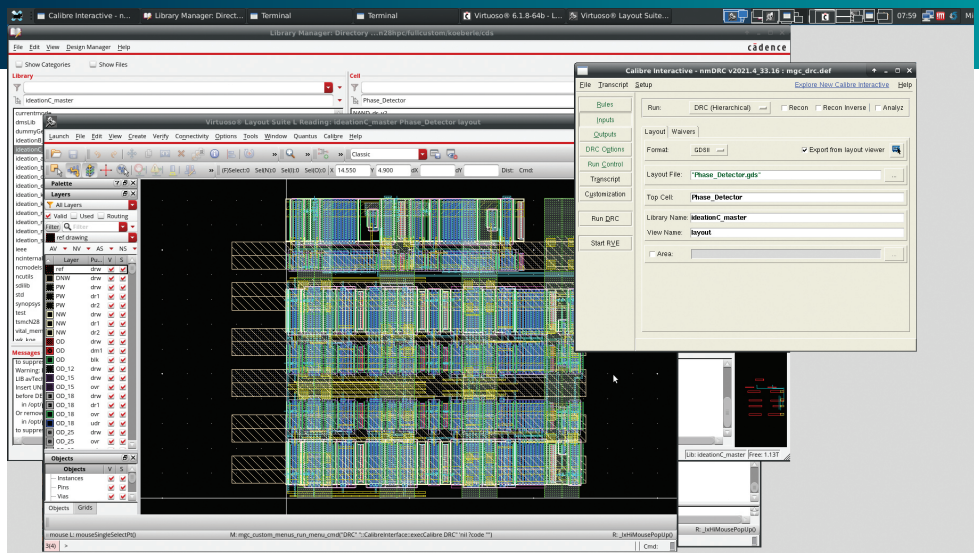
"Our students create their own integrated circuit, performing all the required steps from requirement specification to design and verification to prototype chip production and test," says Dr. Johannes Sturm, head of the integrated systems and circuit design degree program. "This makes them knowledgeable about all stages of IC design, so they are less prone to fall into the traps."

"Using Catapult, we can extend our curriculum with courses in system and chip architecture using the latest software tools. This is key to fulfilling our role, providing the semiconductor industry with the knowledgeable experts it so dearly needs."

Wolfgang Scherr
Head of Research Group for Modeling and Design of Integrated Systems and Circuits
Carinthia University of Applied Sciences

"Using Calibre makes it easy to master the rapidly increasing complexity of integrated circuitry."

Dr. Michael Köberle
Professor, Computer-aided VLSI Design
Carinthia University of Applied Sciences



CUAS students use Calibre to make sure their circuit designs are accurate with precise device parameters.

From PCB design to semiconductor verification

CUAS provides the students not only with the skills required to create future-oriented product innovations, but also acquaints them with the cutting-edge tools and techniques they will be working with in the industry.

During the second part of the systems engineering bachelor's degree program, CUAS students specializing in electronics use PADS™ software for printed circuit board (PCB) design. This is one of the electronic design automation (EDA) solutions that is part of the Siemens Xcelerator portfolio, the comprehensive and integrated portfolio of software, hardware and services.

During the ISCD course, CUAS students also use other Siemens EDA solutions. Notably for IC physical verification, they use tools from the popular Calibre® software throughout their IC design projects. "Using Calibre makes it easy to master the rapidly increasing complexity of integrated circuitry," confirms Dr. Michael Köberle, professor of computer-aided very large scale integration (VLSI) design at Carinthia University of Applied Sciences.

Calibre design solutions are leading industry tools for IC physical verification, delivering a complete verification and design for manufacturability (DFM) optimization EDA platform. CUAS students use Calibre circuit verification with the industry-leading Calibre nmLVS tool to provide accurate circuit behavior with precise device parameters. They also use the Calibre Yield Analyzer for verifying reliability.

> "Questa is clearly the best solution compared to all other tools I am familiar with on the market."
>
> Dr. Michael Köberle
> Professor, Computer-aided VLSI Design
> Carinthia University of Applied Sciences

Taking chip design to a higher level

During the second semester, students also learn how to integrate mixed-signal VHSIC Hardware Description Language (VHDL) designs. They deploy digital simulation to the analog circuitry. For this purpose and for SoC logic verification, CUAS students use the Questa™ software verification solution from Siemens EDA. This functional

Solutions/Services

PADS
siemens.com/eda/pads-professional

Calibre
siemens.com/calibre-design

Catapult
siemens.com/catapult

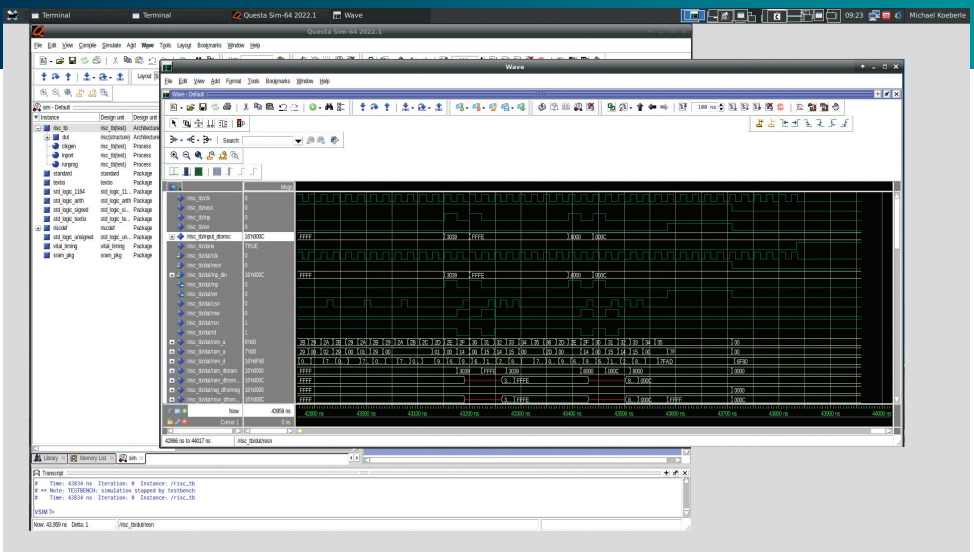
Questa
siemens.com/questa

Customer's primary business

Carinthia University of Applied Sciences is a nonprofit limited liability company in Austria. Its purpose is to establish, maintain and implement UAS degree programs and post-graduate programs in the fields of technology, business, health and social affairs, as well as courses for education and training.
www.fh-kaernten.at/en

Customer location

Villach
Austria



CUAS students use the Questa verification solution from Siemens EDA to tackle the growing size and complexity of SoC designs with mixed-signal architectures and multiple embedded processors.

verification solution unifies a broad arsenal of verification solutions to tackle the growing size and complexity of SoC designs with mixed-signal architectures and multiple embedded processors often based on divergent platforms.
"By integrating powerful analyzing and debugging functionality for the embedded software, Questa is clearly the best solution compared to all other tools I am familiar with on the market," says Köberle.

CUAS students and professors also benefit from the verification academy, a collection of free online courses provided by Siemens EDA. This proved helpful when CUAS started an initiative to implement top-level modeling for full-custom IC design. One of the aims was to seamlessly unify SoC designs with digital and analog portions as well as embedded computing. This can be achieved by changing one's methodology to using high-level synthesis (HLS), an automated design process that begins with a high-level specification of the problem in a language such as C++ and then synthesizing that to register-transfer level (RTL) structure that achieves a given behavior. Using a hardware description language (HDL) this RTL is then synthesized to the gate level by using a logic synthesis tool.

For this purpose, CUAS uses Catapult™ software from Siemens EDA. Thanks to the free on-demand training Siemens EDA provided, professors and students were able to start using Catapult in a matter of days. "Using Catapult, we can extend our curriculum with courses in system and chip architecture using the latest software tools," says Wolfgang Scherr, head of research group for modeling and design of integrated systems and circuits at Carinthia University of Applied Sciences. "This is key to fulfilling our role, providing the semiconductor industry with the knowledgeable experts it so dearly needs."

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