

RWTH Aachen University Prepares Students for Careers in Industry

At RWTH Aachen University, the Institute of Automatic Control prepares students for productive careers in a wide range of industries. The institute’s core areas of study—automotive, rail, medical, and industrial controls—span diverse fields including robotics, mechatronics, biomedical devices, and automotive driver assistance.

To meet industry demand for skilled engineers, RWTH Aachen has integrated MathWorks software into its undergraduate and graduate curricula and provided its students and faculty with campus-wide access to MathWorks tools through a Total Academic Headcount (TAH) license.

“Our industrial partners are very interested in graduates who are familiar with not only control engineering, but also the application of tools and processes,” says Dr. Dirk Abel, professor and head of the Institute of Automatic Control at RWTH Aachen. “MathWorks tools are widely used in the field, and it is important for our students to learn skills that industry demands.”

THE CHALLENGE

The mechanical engineering bachelor program enrolls 1400 new students each year. Abel and his colleagues had to make sure that these students learned the basic theory of automatic controls as well as available controls development tools.

Abel and research associate Jan Maschuw also wanted to encourage a practical approach for their students. “To apply control theory, our students must learn to describe different processes with mathematical models,” says Abel. “This involves a great deal of systems theory,” adds Maschuw. “To



Maschuw and Abel working with students in the lab.

deepen their understanding of the methods we show them, our students need to see what happens when you apply these methods with the help of numerical tools.”

Abel and Maschuw found that colleagues in other departments, including electrical engineering and natural sciences, had similar goals. “Our industry partners are looking for students who are familiar with numerical tools. Departments across the university wanted to integrate the tools throughout their curricula,” says Abel.

THE SOLUTION

RWTH Aachen adopted MathWorks software campus-wide, providing students and faculty with access to MATLAB®, Simulink®, and more than 50 companion toolboxes, blocksets, and other products.

With their colleagues from other departments, Abel and his researchers offer special workshops and weekly sessions to help students expand their use of MathWorks tools. Attended by about 100 students and lasting one to two hours, these meetings include introductions to MATLAB, Simulink, and Stateflow®, as well as advanced sessions on applying the tools in image processing, GUI programming, and bioengineering.

THE CHALLENGE

Prepare students to enter industry with practical engineering skills

THE SOLUTION

Integrate MathWorks tools into engineering curricula and enable access campus-wide

THE RESULTS

- Students equipped to meet industry needs
- Increased flexibility for students and faculty
- Research efforts accelerated



MathWorks tools enable us to extend the range of topics that we can introduce. It would not be possible to teach modern control systems and theory if our students did not have access to tools like MATLAB and Simulink to complete exercises.



Dr. Dirk Abel, RWTH Aachen University

MathWorks tools are incorporated in courses across many disciplines. In the course Advanced Controls, students tackle complex problems in nonlinear control and optimal control using MATLAB and Simulink for analysis and simulation.

Biology and chemistry students interested in control theory can take Control Engineering for Biomedical Engineering Science, a graduate-level course. In this course, Maschuw teaches system theory and control using MATLAB and Control System Toolbox™ to present examples from the students' own fields.

Engineering students in Abel's Rapid Control Prototyping course use MATLAB, Simulink, and Real-Time Workshop® to design, simulate, optimize, and implement a real-time control system for a specially modified Segway personal transporter. Students are also beginning to work with xPC Target™ for rapid prototyping on robotics projects.

Abel and Maschuw use the same MathWorks tools for rapid control prototyping in their own research. In one project that focused on the lateral and longitudinal control of automobiles, they designed and simulated the control system with Simulink. They used Real-Time Workshop to generate code in preparation for test trials and to perform on-road tuning of the controller in the vehicle. Later, they analyzed the data recorded during the trial using MATLAB.

In cooperation with the university's industry partners, students study model predictive control and use MATLAB and Model Predictive Control Toolbox™ to program a control solution that can be integrated into a Siemens process control system.

THE RESULTS

■ **Students equipped to meet industry needs.** "Although our program is fairly new, we have already gotten positive feedback from past students and our partners in industry concerning our students' ability to come up to speed quickly when they begin work," says Abel.

■ **Increased flexibility for students and faculty.** "With the university's TAH license, students are free to use MathWorks tools to collaborate and to work on assignments or research projects almost anywhere," says Maschuw. The faculty has more flexibility in developing courses because they know students can use the tools on their own laptops, rather than competing for limited lab space.

■ **Research efforts accelerated.** "MATLAB and Simulink provide a structured, visual environment that makes it easy to communicate with other researchers," says Maschuw. "We have also seen a significant return on investment in terms of graduate students who can contribute to research efforts right away because they are already familiar with MathWorks tools."

Learn more about RWTH Aachen:
www.rwth-aachen.de/go/id/bdz

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