

## Advanced Computer Engineering Courses at the University of Wyoming? Not Without Tektronix Logic Analyzers.



### Solution Summary

Challenge	Develop and implement advanced computer engineering courses that provide sophisticated instruction on the intricacies of microprocessors and real-time embedded systems.
Solution	Tektronix TLA5201 logic analyzers, featuring high-speed timing resolution, fast state acquisition, deep memory, and powerful triggering.
Benefits	Ability to view complete system activity, capture numerous signals simultaneously, isolate problem areas, and troubleshoot complex designs.

A professor, some students, and a syllabus are the primary prerequisites for college courses. For the University of Wyoming's electrical and computer engineering department, however, the implementation of advanced design courses required one additional ingredient: cutting-edge logic analyzers.

The university's computer engineering program teaches students design techniques for digital signal processing, embedded control systems, and hardware descriptive language techniques, among other core topics. Being a relatively new program, the department has gradually added complexity and advanced subject matter to the computer engineering curriculum.

"I've wanted to implement progressive microprocessor and real-time embedded systems classes for a few years, but it was not possible without state-of-the-art test and measurement tools – particularly logic analyzers," said Dr. Steve Barrett, assistant professor of electrical and computer engineering at the university.

The department chose Tektronix TLA5201 logic analyzers because of their troubleshooting and debug capabilities, simplicity, and affordability. As a result, the department has been able to develop innovative courses that significantly bolster their overall curriculum and expand the education of its engineering students.

"Quite simply, our new advanced design classes would not be possible without the finest logic analyzers," indicated Dr. Barrett. "Our students have been thrilled with the sophisticated design insight and technique the instruments are providing. Tektronix logic analyzers are enabling us to send better engineers into the workforce."

### TLA5201 Logic Analyzers Deliver Troubleshooting Proficiency, Simplicity

The affordable TLA5000 Series logic analyzers offer high-speed timing resolution, fast state acquisition, deep memory, and powerful triggering – perfect for universities with diverse instructional needs and nominal technology budgets.

In addition to enhancing a pre-existing Microprocessor class, the TLA5201 logic analyzers have made possible two advanced courses at the University of Wyoming: Embedded Control Systems and Real-Time Embedded Systems. The design complexity increases in each of the three courses respectively.

A requirement of all Wyoming electrical and computer engineering students, the Microprocessor class teaches the basics of microprocessor operation, including addressing, read/write cycles, serial communication, and signal behavior. Dr. Barrett uses the TLA5201 in classroom and lab instruction.

"In the past, my lessons were very static. Using the TLA5201, I can teach in real-time, showing live signals and microprocessor activity," he said. "The system visibility provided by Tektronix instruments is unsurpassed, and greatly enhances my ability to illustrate microprocessor operation."

The Embedded Control Systems course builds upon the students' understanding of microprocessors and teaches them to design and troubleshoot their own set of subsystems. After developing up to five subsystems, the students use the TLA5201 logic analyzers to ensure that everything is working in unison and without error as part of a functional embedded system.

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-Dr. Steve Barrett, University of Wyoming

A large portion of the course is dedicated to troubleshooting problems as they emerge – a pillar of design engineering. With high-resolution MagniVu timing resolution, the TLA5201 logic analyzers make it easy to find difficult problems such as digital logic errors, glitches, setup/hold violations, and crosstalk.

"Tektronix logic analyzers are easy to use, but they don't compromise functionality," indicated Dr. Barrett. "Using the TLA5201, our students can view many channels simultaneously – including address lines, data lines, and control signals – to easily locate and isolate problems."

The Real-Time Embedded Systems course goes one step further, with the students designing multiple microprocessors – each with their own subsystems – to form a small network.

According to Dr. Barrett, it's a very difficult course to teach because there are so many things happening at once within and among the microprocessors, and the students need to understand and control every facet of the system. "A microprocessor alone has to do so many things at once. Adding multiple microprocessors into the equation and ensuring they're working in harmony increases the complexity dramatically," he stated. "The TLA5201 has been essential in helping our students see, understand, and manipulate the immense activity taking place within their networks."

The TLA5201's performance – 500 ps timing resolution and 32 MB record length with simultaneous 125 ps MagniVu timing resolution within each acquisition, allows the students to measure digital signal timing on fast, complex signals to ensure their networks are functioning properly. And the students can use setup/hold violation triggering and display to validate setup/hold performance of their digital devices.

The department could not be happier with its new Tektronix TLA5201 logic analyzers. Barrett added, "This week I had a student who had a sticky timing issue with his senior design project. It was a serial interface to a liquid crystal display. He had worked for hours trying to troubleshoot the malfunction. I suggested he try the new logic analyzers. I was busy helping other students so I only had time to quickly show him how to connect the test probes to his setup. He powered up the logic analyzer and had a trace of the faulty data stream within five minutes. He quickly zeroed in on the malfunction. I believe the students' experience with Tektronix logic analyzers has made them better troubleshooters in particular and better engineers in general."