

Putting Theory into Practice: China's Xidian University Employs Tektronix Oscilloscopes to Increase Student Innovation



Solution Summary

Challenge	Moving students beyond theoretical learning into the practical application of electronic design and experimentation.
Solution	Tektronix TDS1000 Series oscilloscopes with advanced triggering, Fast Fourier Transform (FFT) functionality, and digital real-time acquisition technology, ideal for capturing transient and single-shot events.
Benefits	Improved learning and student innovation through the effective test and debug of digital signal processing and microcontroller design.

Dedicated primarily to electronic technology and information, Xidian University is among an elite class of institutes for higher education in China. The university has a commitment to excellence in both teaching and research – a commitment Xidian Professor Guo Wanyou strives to continually build upon and bring to his electronic engineering courses.

With limited resources and outdated technology, Professor Guo has relied primarily on theory to increase the knowledge of his engineering students. He has been frequently frustrated by the confines of theoretical learning.

“I want to increase my students’ innovation,” said Professor Guo, “But in order to do so, they need hands-on experience with today’s technology. I can tell them how to design a digital circuit and we can discuss the expected outcomes, but until they are able to test their designs and see the true results, they can never improve upon them.”

In moving his students beyond theory into the practical application of technology, Professor Guo employed Tektronix TDS1002 oscilloscopes in two electronic design courses, focused on Digital Signal Processing and Microcontroller Design.

Professor Guo is very pleased with the new teaching methodology Tektronix instruments make possible. By conducting electronic experiments in a lab setting, experiencing the intricacies of today’s digital technologies, and learning how to solve the real-world problems they present, his students gain a much better understanding of design engineering.

According to Professor Guo, “Tektronix oscilloscopes have helped my students become better engineers by providing hands-on access to industry-standard test equipment they will find in their careers.”

TDS1002 Oscilloscope Brings Functionality and Simplicity to Student Labs

The TDS1000 Series digital storage oscilloscopes deliver an unbeatable combination of superior performance, unmatched ease-of-use, and surprising affordability in an ultra lightweight, portable package. The instruments are perfect for laboratory courses, according to Professor Guo. In addition to their affordability and small size – which allows additional workstations in the lab – the TDS1002 oscilloscopes deliver simplicity without compromising performance or functionality, ideal for classroom instruction and learning.



A 2-channel oscilloscope with 60 MHz bandwidth, 1 GS/s sample rate, and digital real-time acquisition technology, the TDS1002 is an entry-level instrument designed for users who need the performance and ease-of-use found only in a digital oscilloscope. The TDS1002 features an automatic setup function and familiar analog-style controls combined with a multi-language (including Simplified and Traditional Chinese) user interface.

In his Digital Signal Processing (DSP) course, Professor Guo teaches his students to generate digital signals, and then acquire, analyze, and debug the signals with Tektronix oscilloscopes before and after they are processed.

A key benefit of the TDS1002 instruments is their Fast Fourier Transform (FFT) math function, which allows the students to analyze, characterize, and troubleshoot circuits by viewing frequency and signal strength. This functionality is key to understanding how today's digital signals are processed.

"The TDS1002 oscilloscope is a valuable asset for enhancing the education of tomorrow's engineers."

- Professor Guo Wanyou, Xidian University

"In the past, our students were merely theorizing designs," indicated Professor Guo. "With the TDS1002 oscilloscopes, they are now able to create, test, debug, and enhance their own designs. And they can use the instruments' advanced functionality to view different waveforms – such as FFT, IIR, and FIR signals – in the time and frequency domains and compare how they are affected by the microprocessor."

The oscilloscope's digital real-time acquisition technology – ideal for single-shot waveform capture – and advanced triggers are also important when teaching digital signal processing, according to Professor Guo. The acquisition technology makes it easy for his students to locate and isolate signals of interest, such as elusive glitches and random faults.

In the Microcontroller Design course, Professor Guo teaches his students about highly integrated

chips often found in consumer products. Using Tektronix oscilloscopes, the students learn how a digital signal is affected as it flows from a single circuit to the microcontroller.

Whereas the Digital Signal Processing course focuses on a single manipulation of digital signals, students in the Microcontroller Design course need to understand how signals behave as they travel from point-to-point and throughout a system.

The broad functionality and 11 standard automatic measurements of the TDS1002 are optimum for viewing activity across an entire digital system, indicated Professor Guo. And the simple user interface with analog-style controls makes the TDS1002 easy to use, reducing learning time and increasing efficiency. Innovative features, such as the autoset menu, probe check wizard, and context-sensitive help menu optimize instrument setup and operation – allowing students to focus on their designs, not the design tool.

"Truly understanding both the theoretical and practical application of digital signal processing and microcontroller design is not possible without the best tools," said Professor Guo. "The simplicity and functionality of Tektronix instruments enable my students to conduct their own experiments, troubleshoot problems as they will in their future careers, and develop their own design methodologies. The TDS1002 oscilloscope is a valuable asset for enhancing the education of tomorrow's engineers."