

### UNDERGRADUATE ENGINEERING LEARNING AT THE SPEED OF CHALK

ASHOK AMBARDAR CAME to Michigan Tech to teach undergraduate electrical engineering in 1976. "There was only one blinking light on Sharon Avenue back then," he recalls. Ambardar grew up in Kashmir, in the foothills of the Himalayas. He left home at age sixteen to go to college.



**Ashok Ambardar**

**Q:** How did you end up in this line of work?

**A:** I'd been thinking about teaching from the time I was a student. Truthfully, I stumbled onto this area of engineering. The mechanical engineering program was full, so my advisor suggested electrical. Then, during my master's program in India, friends had gone abroad and said, "You must come visit, and go for a PhD." Before you know it, this job at Michigan Tech came up. I applied for it, and here I am.

**Q:** Have you noticed any changes in undergraduate EE students over the past thirty-three years?

**A:** Math skills are weaker. I've noticed the dilution of the standard high school education. Not that they're not being taught as much. It's that there's a mindset change, with computers, TV, video games. Students are now more active in other areas, and there's only so much time in a day.

It's more of a challenge to teach today's students, definitely. If you look at how the world is now, those very same people are the ones making advances in the technology we are enjoying. So things are different, but not always necessarily bad. Instead of always coming down hard on these youngsters, we need to realize that the changing nature of technology is affecting them. Kids are growing up and interacting with technology at such a young age.

The technology kids are using now takes away two or three

senses at one time—eyes, hands, and ears. I don't know how that bodes for their relationships, when so much communication isn't expressed physically in-person anymore, but through technology. They are using technology, but fewer numbers are pursuing it as a career. They'd much rather play with it than design or develop it.

**Q:** Do you enjoy teaching?

**A:** I enjoy every moment of it. I teach Circuit Analysis—it's a tool more than anything. These are problem-solving courses. I lecture with the chalkboard exclusively. That way I know when to strike when it's hot, with the right data and the right approach for the class on that particular day, for those particular students. No two lectures are alike.

Nowadays, many instructors and professors present their lectures using PowerPoint and later post them online for students to access at will. The option then exists for a student to skip class. The best thing about a chalkboard is that you can erase it. If a student isn't present, he won't have the notes, and then what? If everyone shows up, and more are in the class than not, the discussions are more interesting. Learning moves at the speed of chalk.

**Q:** You've never once used PowerPoint?

**A:** No. Using PowerPoint at a seminar, a professor talks, and then up comes the slide. Thirty seconds later comes the next one. And the next. And so on. It's information overload. Professors often tend to give out more information than students can really absorb. Plus once you set up the slides, chances are you won't change your presentation. So you don't have the benefit of changing it the next time.

I like to look at the group and tailor instruction to their needs. I want to make sure they get the idea, and work on it. I don't want them to be afraid of being tested on it.

I feel guilty grading exams. If I had my way, I'd just teach. Let's get it to the point of becoming comfortable, and then move on. It seems as though everything in society moves on the numbers—that there's just one sphere of success. But that's not the point of education. The point of education is to become complete human beings. If I can ask questions that make you think, and show you several ways of attempting to answer a question, then it's been worthwhile.

**Q:** What is the most meaningful experience you've had as a professor?

**A:** I've had several students over the years who, after

receiving a grade of F, came back to retake the course, and earned a grade of A.

**Q:** What about class size? Has that changed?

**A:** When you are doing graduate-level teaching, you have a small group of students. You bring in your interests, such as journal articles, to offer different perspectives. It's a less-structured format.

By force of the numbers of students, undergraduate education must be structured. Class sizes range from twenty to one hundred. If I were a student, I'd think it was nice to be in a smaller class, but then you must be up to speed!

**Q:** What concerns you the most these days?

**A:** The pace at which technology moves means more for kids to learn, and there's only so much time to learn it. Nowadays, electrical engineers are being urged to specialize early, because of this rapid pace.

**Q:** What excites you the most about the changes you have seen in technology over the past thirty-three-plus years?

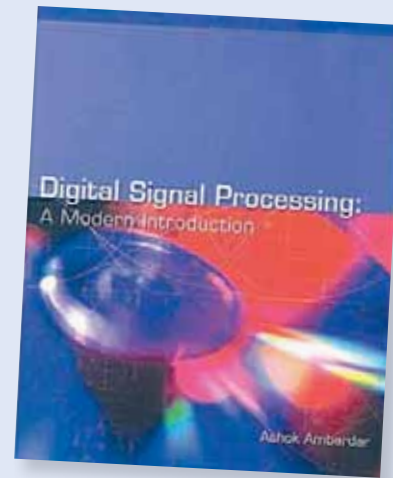
**A:** These are exciting times for technology. It is bringing people together, especially those in rural and areas of the developing world where there is no electricity or running water. Farmers will be able to get crucial information on growing crops, for instance. The potential benefits are so great.

**Q:** What is your advice to a young undergraduate engineering student? How can he or she be successful?

**A:** Look to what you are really interested in and see where that takes you. Don't be afraid to look at the world around you, ask questions, and be curious. If you want to feel good about what you are doing as a profession—working for its own sake, as opposed to simply putting food on the table and a roof over your head—then you need education.

Young people are much more idealistic than we adults. It's good to have them looking out for others, creating a revolution.

### DIGITAL SIGNAL PROCESSING—A MODERN INTRODUCTION



Professor Ashok Ambardar is the author of three textbooks, the latest of which is *Digital Signal Processing—A Modern Introduction*, 2nd Edition (CL Engineering 2006).

"With textbooks, each chapter is peer-reviewed one at a time. It's like playing Russian roulette—each reviewer has a different viewpoint. The approach in the book is going to be criticized; that's a given, so you keep your fingers crossed, hoping to get three good reviews in a batch. But all in all, writing a textbook is much more fun than writing an article for a journal. I do it for fun."