How do we train today’s students to become tomorrow’s engineers?

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The days when we could design things by connecting up standard cells are long gone. The well-rounded engineer must not only know logic design, circuit design, and physics, but should also have some background in optics in order to understand how circuit structures will wind up looking in silicon. The Special Section on Computer-Aided Design for Emerging Technologies in this issue of D&T makes me think that the engineers of the future will need to learn even more. They’ll have to go deep into quantum physics to understand quantum cellular arrays. They’ll have to add mechanical engineering to their portfolios to understand SoCs with nanomachine cores for doing tasks beyond the capabilities of today’s designs.

If we use DNA devices for future designs, our engineers will have to spend some time in the biology department. Undergraduates now sequence DNA in their labs. Perhaps, in 20 years DNA sequencers will be located on the test floor right next to the ATE. Today’s engineers need to understand statistics, and statistical methods are becoming more important in areas such as adaptive testing. If design moves into the quantum realm, statistics will become truly mainline, as the boundary between a good circuit and a bad one will become increasingly more fuzzy.

Perhaps engineering departments shouldn’t let students even see an AND gate until they’ve had quantum physics, mechanical engineering, molecular biology, and statistics. The time to start is now, because by the time a student gets out of graduate school and has been working long enough to obtain a lead position on a design team, these new technologies will be upon us. But not all of these technologies will be successful. So, should departments teach the basics of everything to everyone, or should they bet on a technology to win, and teach it in depth? We know that the purpose of a university education should be to learn how to learn, but we might be asking the engineers of the future to go well beyond traditional engineering. You can’t switch from quantum physics to biology by attending a few tutorials, and it is unlikely that tomorrow’s engineers will have more time for training than we do today.

CAD engineers have it even worse than your average engineer, because they have to hide as many of these factors in their tools as possible. This will be even more difficult in the years to come. They will need to understand the issues not only for one design process but for many, so that they can make their tools useful for the broad market.

Seems impossible, doesn’t it? But, before you send your children off to law school, consider that the successful engineer of the future won’t be the one who tries to do it all alone but rather the person who gets subject-matter experts to talk to one another, builds consensus on the approach to take, and judges which of several competing answers is the best one. Just as CAD tool suites of the future will have to understand physics, optics, mechanical engineering, statistics, and perhaps biology, the design team of the future must include people who understand all these things. The universities of today should start training engineers to work on the design teams of tomorrow.

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