OAKLAND UNIVERSITY

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Students develop biological electronics

*By **Jeff Samoray**, OU Web Writer*

It's a tale out of science fiction, but Oakland University students in Electrical Engineering 495/595 are closer to making it a fact. Through an interactive video network, OU students are collaborating with students and faculty from four other institutions to develop electronic systems that mimic biological functions – in short, creating components of a digital human.

The two undergraduates and six graduates in OU's class, titled "Very Large Scale Integrated Circuits (VLSICs) for Multidisciplinary BioTechnology Designs: System-on-a-Chip (SoC)," are working in teams to develop portions of four digital components: a custom hearing aid, a bionic arm, bionic eyes and a bionic nose.

OU Associate Professor of Engineering Hoda Abdel-Aty-Zohdy, who also directs the **Microelectronic Systems Design Lab**, developed the course with faculty from the Air Force Institute of Technology, which provided partial funding. Other participating schools include the University of Cincinnati, Ohio State University and Wright State University. OU is one of the first five universities in the nation to offer such a course.

"There have been many developments in microelectronics over the past 20 years," Abdel-Aty-Zohdy said. "Computers can be really stupid and not very precise sometimes. In the 1960s, an experiment was conducted comparing the cognition of a pigeon's brain to a super computer, and the pigeon won – it wasn't even close.

“We know there are limitations in electronics, and we're trying to learn more from biology. We're interested in using our understanding of the electronics aspects of biological systems to go back to biology and develop biologically controlled thinking systems."

Such systems would be capable of achieving much higher memory control and run at speeds much faster than today's electronics, Abdel-Aty-Zohdy said. Possible applications could include an electronic nose for chemical and biological sensing.

"We're almost at the point of achieving an electronic nose with bloodhound-like capabilities – I'm not kidding," Abdel-Aty-Zohdy said. "Most likely, within 10 years, a bionic eye will have been developed."

OU students spend the first half-hour of each class going over the details of their projects. The remaining hour is spent participating in real-time video collaborations with the other universities. Students can see and hear guest speakers, faculty and students from the other institutions via a video data projection system and wall-mounted speakers. OU students are free to ask questions and compare notes on their respective projects through in-class video cameras and microphones.

"The class is very cutting-edge in both material and presentation," said second-year graduate student Priya Ramakrishnan, who's developing a component of a bionic eye. "It's great to be able to involve professors and students from other schools. We have access to a lot more knowledge and can consult them. The class feels broader since many more people are able to provide input."

Senior electrical engineering major Michael Coraci, who's developing a component of a bionic nose, said he appreciates the multidisciplinary aspects of the course.

"Because of the videoconferencing, we are able to learn a lot from many different people across the disciplines," Coraci said. "The technical material is very multidisciplinary because it involves engineering and biology."

Abdel-Aty-Zohdy said she hopes she can integrate more disciplines into the course in future semesters.

"This is a special course I would very much like to offer again," Abdel-Aty-Zohdy said. "I'd like to integrate chemistry, biology and physiology along the same topic. No one department or university can develop these electronic systems alone. It requires multidisciplinary collaboration."

For more information on VLSIC development at Oakland University, visit the **Microelectronics System Design Lab** Web site.

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