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Clemson graduate students Shayne McConomy, left, and John Adcox use a computer measuring device to measure points on a car.

Deep Orange designed to put auto ideas on road

Students build cars from scratch in new Clemson program

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For master's students and some doctoral students in Clemson University's automotive engineering program, the class project can get a little complicated.

Over the course of two years, the students must identify and integrate the technologies and components needed to create an entirely new vehicle. They must build the working prototype from scratch and document all of the steps along the way.

The program, called Deep Orange, is designed to emulate vehicle development programs in industry and immerse students in systems integration, the discipline that is the focus of Clemson's engineering studies at the International Center for Automotive Research in Greenville.

Students research a target market, create a concept, engineer and fabricate components, analyze manufacturing processes, and test the final vehicle. They may make some of the parts themselves in a machine shop and acquire others as donations from parts suppliers.

The automotive engineering program needs "something sparky" to stand out, and Deep Orange fills the bill, said Imtiaz Haque, executive director of Clemson's graduate engineering center at ICAR.



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Professor Paul Venhovens works with Clemson graduate student Robert Mau.

Launched in April, Deep Orange is the brainchild of professors Paul Venhovens and Steve Hung, both of whom spent years in the automotive industry before joining Clemson.

Venhovens, who worked at BMW's re-

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search and development headquarters in Germany, said he wants to prepare students for a future automotive industry much different from today's — one with numerous startup automakers pursuing niche markets and "disposable" factories without paint shops or metal stamping.

In having students produce real cars from soup to nuts, Deep Orange is making innovations tangible, Venhovens said.

"You can write it on a piece of paper. You can make a Power Point on it. You can write publications on it. But if you don't make it, people don't believe you," he said.

Hung, who used to work for Ford Motor Co. and Visteon Corp., said Deep Orange will create a pipeline of new ideas to try out on new vehicles.

"If it all comes to fruition the way we hope, the rewards should be sweet," he said.

To help cover the costs of the cars students will build — possibly hundreds of thousands of dollars for each vehicle — Clemson wants automakers and parts suppliers to contribute through an industry consortium. What benefits the companies get depends on how much they give.

At the low end, companies may make in-kind contributions of goods or services and be publicly thanked for it.

At the high end, they pay an annual membership fee of $75,000, which gives them some say in what kind of cars get built, as well as access to testing equipment and research data and preference in negotiating technology licenses.

Clemson believes companies will be interested in testing and showcasing their products and technologies in the cars that students build.

"We win because we get involved in real-world engineering," Venhovens said. "They win because we collaborate with them in getting this technology pure and proven."

Clemson also believes companies will find Deep Orange valuable for recruiting top-notch engineering students.

So far, there's interest but no contracts, Haque said.

"We don't have anyone's signature on the dotted line yet, but we have a lot of conversations going on," he said.

One place Clemson is looking for partners is among the 7,500 members of the Specialty Equipment Marketing Association, a California-based trade association for companies and organizations that make, buy, sell or use specialty equipment for vehicles such as audio systems or street rod parts.

SEMA members need to know how to integrate specialty equipment into various vehicle platforms, and Clemson's experts can help, said John Waraniak, the association's vice president of vehicle technology.

"Having access to that systems engineering expertise is very valuable to us," said Waraniak, an engineer who formerly worked in the aircraft industry.

Clemson plans to display the student-built vehicles at car and trade shows around the world. The first prototype, designed to please young adults ages 18 to 25, is expected to be completed in April. It's being created from a BMW 1 series hatchback, though the future plan is to start each project as a blank slate, without any pre-existing vehicle architecture, Venhovens said.

Deep Orange is just one of the initiatives of Clemson's automotive engineering program, which in its third year is already one of the university's premier programs.

Students have access to the latest testing equipment in the 90,000-square-foot graduate engineering center with iconic architecture.

Among the 10 faculty positions are four professorships endowed with $18 million in state lottery money and another $18 million from private industry.

Clemson figured the program would be five years old before enrollment hit 50, Haque said, but this year it has 76 students from around the world, 48 pursuing master's degrees and 28 doctorates. More than 30 percent of the students, 24 of them, are from India.

"The program is going gangbusters," Haque said, though it's too early to say whether it will have the international reputation Clemson wants.

John Adcox, a 23-year-old doctoral student from Tennessee, said his research showed Clemson was the only university in the country offering a Ph.D. in automotive engineering.

Adcox, who got his bachelor's degree in mechanical engineering from Tennessee Tech, leads the drive line group working on the first prototype car.

"It's a very challenging course load, but it's good because we're learning a lot, and you really get good at your time management skills," Adcox said.

He's visited local plants operated by Michelin North America and BMW Manufacturing Co. as part of his studies and hopes some day to work for a major automaker as a vehicle dynamics designer.

Professors in the program, in addition to teaching students, conduct research with numerous companies.

Among the firms they've worked with, Haque said, are Ford, BMW, General Motors, Toyota, Honda and DiMora Motorcar, a California company that sells a luxury sedan for $2 million.