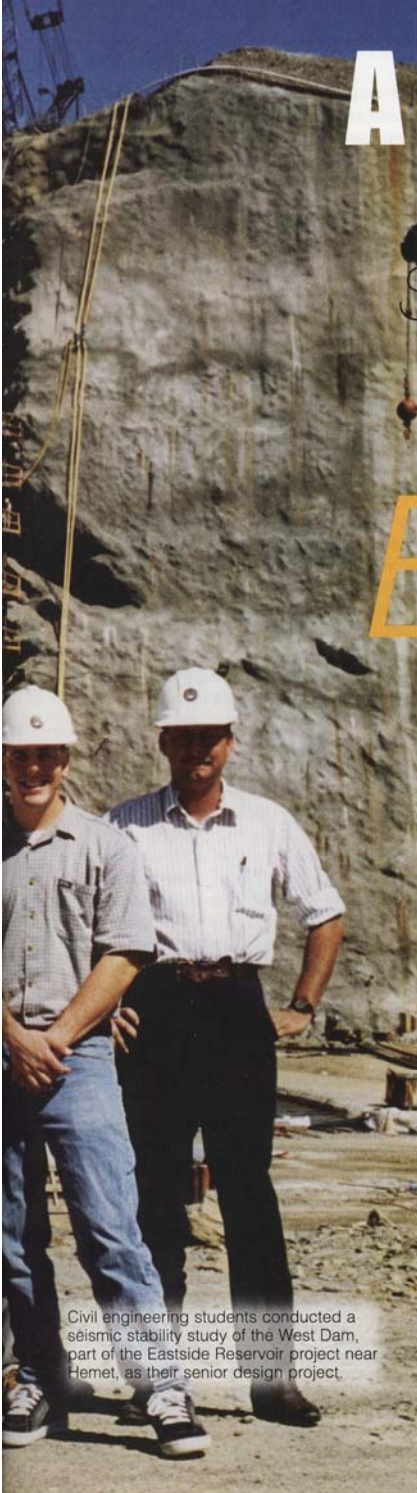


## Senior design class gives engineering students real-world experience

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**Note by Professor Costea:** In the Spring 1999 issue of the CSUN “Northridge” magazine there was an article about the real-world experience offered to the senior design class. A section of the article is dedicated to each engineering department of the CECS College. The pictures inserted in the article represent projects by students in Professor Costea’s MSE408/L course (now MSE508/L:Principles of CAD/CAM). Then the course used the SDRC I-DEAS software package; today the course is taught with SolidWorks. Two apparently non-engineering 3D-models, a cyber dragonfly and a rose are presented. Both the rose and the dragonfly are nature’s complex assemblies, made of numerous component parts.

“... good proof that engineering skills and tools can be used for artistic achievements”  
Ileana Costea, Ph.D.



Civil engineering students conducted a seismic stability study of the West Dam, part of the Eastside Reservoir project near Hemet, as their senior design project.

# A Two-Semester Trial by Fire

*Senior design class gives engineering students real-world experience*

Each year engineering seniors undergo a two-semester trial by fire—the college's mandatory senior design course. Its purpose is twofold: to provide a culminating experience for students and to help them make a smooth transition to their future jobs in industry.

"In today's market there's no such thing as training on the job," says Ichiro Hashimoto, professor of electrical and computer engineering, who teaches the senior design course for his department—one of four within the college. "There's no money for it."

In some cases, senior design is the first time students must make something work instead of simply learning how it already works. Most emerge from the experience better problem solvers and team players. Some even have job offers in hand.

"Many manufacturing companies want CSUN students," says Ileana Costea, professor of manufacturing systems engineering. "Students who took last year's senior design class in manufacturing have already found jobs. Manufacturing firms want good people, and they take CSUN's

students because they think they are good. Most of our graduates are hired immediately, as soon as they finish their studies."

The exact format of the senior design experience varies from department to department and sometimes from year to year, but in every case, the challenging year-long course requires students to make an intensive, extended effort, both individually and as part of a group. The following are some of the highlights of recent senior design experiences:

## **Manufacturing systems engineering**

Many small and medium-size manufacturing companies are located close to Cal State Northridge, and last year, students in the senior design class worked on projects for some of them.

One team working with Future Media Productions, Inc., a CD-ROM manufacturer in Valencia, developed a device to count CD-ROMs in the factory automatically rather than by hand. Students first looked at the company's requirements and conducted market research to determine what it would take

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—Steve Gadomski  
chair of the civil and manufacturing engineering department

## Trial by Fire



Neither these photos nor those on the facing page represent senior design projects, but they are examples of solid modeling by CSUN graduate engineering students. Automation engineering student Lina Eilia Serhan designed this rose, which differs from traditional computer animation in that you can actually conduct mechanical tests on it. If you apply force to it, it will react like an actual rose. Solid modeling is used to analyze the functional characteristics of a part, product or system under design without casting a mold.



to create a good, fast, accurate counting device that could be integrated into the manufacturing process. Based on the research, they developed a pneumatic drive slide to carry sensors, tested a prototype and submitted a report with recommendations.

Another team of students worked with Medical Data Electronics in Arleta, a firm that produces electronic devices for the medical field. The company was developing a new patient bedside monitor and assigned the students to create an assembly line to produce it. In the process the students introduced Medical Data Electronics to a concept they had learned in another course: demand flow technology (DFT). DFT gives precise measurements of the time and people required to complete a task along a technological process.

A third project involved a collaboration with a Chatsworth High School team taking part in a national high school robotics competition. The Northridge team worked with the high school students and industry volunteers to help them design the robot.

### Civil engineering

Civil engineering seniors found themselves part of a mammoth public works project last year, when their senior design class studied the Eastside Reservoir project near Hemet. The reservoir, a project of the Metropolitan Water District, will double the emergency water capacity of Southern California for six months and when completed will be as large as four Castaic reservoirs.

Working with MWD staff, CSUN teams examined various aspects of the project in order to gain insight into the real work of civil engineering. One group conducted a seismic stability analysis of the West Dam. Two groups studied the inlet-outlet tower for seismic stability. Another looked at the pressure pipeline, a 16-foot diameter pipe that will be used to fill the reservoir, addressing such issues as pressure and the possibility of resonance due to vibrating force of water coming in and out of the tower. Another looked at the emergency spillway.

"MWD has been absolutely fantastic with our senior students," says Steve Gadomski, chair of the civil and manu-

facturing engineering department, who teaches the senior design course in civil engineering. "A lot of the engineers said they wished they'd had the opportunity to do this when they were students."

### Electrical and computer engineering

Seniors majoring in electrical and computer engineering complete two projects, one individually and one as part of a group. On the second day of class, Professor Ichiro Hashimoto has students bring resumes to class, and on the third day, he assigns them their individual and group projects "They don't have a choice," he says. "It's like a job."

The projects may be analog or digital or a combination of the two. The group projects may include robots or digital oscilloscopes or straight electronics projects like complete stereo systems, from beginning to end. A recent direction is the design and construction of components that go into personal computers. Last year, for example, students designed and produced a PC video board that allows a user to watch TV on a PC. One new project is requiring students to learn how to sketch on an oscilloscope. Each year, some students also take part in a Micromouse competition, building a robotic mouse that can reach the center of a maze.

"The class is pretty severe," Hashimoto admits. "The projects are always challenging. The individual project is due in December and the group project in May. If it's not done, the students will have to come back next year and do the whole thing all over again."

This year, eight students are working on a special project under the direction of Ben Mallard, professor of electrical and computer engineering. Using the college's new Class-10,000 clean room for the first time, senior design students will conduct microelectronic projects, using bare die chips, or unpackaged integrated circuits, to design hybrid circuits.

"Like industry, we're attempting to define our own miniaturization process," Mallard says. "We wanted these eight students to be the vanguard group to use the lab and practice the art of solid state electronic design and development. This is a first for our department as well as the College."

## Trial by Fire

### Mechanical engineering

Seniors in mechanical engineering have a choice between two design projects, both tied to national competitions. The first one, SAE Formula Car is a scaled-down formula racing car, which students design and build to enter in the Society of Auto-motive Engineers' annual spring competition. The other, FutureCar, is part of a national effort to develop a family sedan that triples the average 1994 family sedan fuel economy of 26 miles per gallon by the year 2004.

In the 1998 SAE Formula Car the team placed 22nd out of 110 entries—the best CSUN has done in the past 10 years. The car had no failures, and it placed second overall in fuel economy. This year's team aims to improve the car's reliability while increasing its performance and reducing its weight.

Each participating university has adopted its own approach to FutureCar. At Northridge, student teams have focused on different aspects of the problem each year. In the first year, the primary emphasis was on a new power train. The team built a parallel hybrid electric power train that is dominated by electrical power in urban driving and by traditional internal combustion power on the highway.

Other years, teams have worked with alternate materials to lighten the vehicle, including carbon composites and Lexan, a near-indestructible plastic. They have also made some minor aerodynamic modifications to reduce drag and have incorporated an electric-driven heat pump to replace air conditioning and heating systems. This year's goals are to complete the program that was started four years ago and to have a successful demonstration of the parallel hybrid design.

"Through the senior project, we aren't necessarily trying to get students ready for industry so much as helping them understand that when they graduate, they have to be able to do something," says Hashimoto of Electrical and Computer Engineering. "Our hope is that after senior design, when they get a project, they won't ask, 'How do we get this done?' but rather, 'When do you want it?'"

—Sarab Lifton



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—Ichiro Hashimoto,  
professor of Electrical and Computer Engineering

Graduate engineering student Ervin Bakshanian designed this cyber dragonfly, which appeared on the cover of the annual calendar published by Structural Dynamics Research Corporation (as did the rose opposite). His professor, Ileana Costea, notes that the piece "makes good proof of an important concept: the fact that engineering tools and skills can be used for artistic achievements."



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## **The Queen and I Tamara Seikaly '92 in the court of Jordan**

**The '60s: Days of Protest**  
**The '90s: Days of Diversity**

