Students

Friday is D-Day for CSU engineering students

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For senior engineering students, Colorado State University's E-Days event is more like D-Day. It's the day they showcase their senior design projects, which are months in the making. The Engineering Days Senior Design Showcase is Friday, April 25, at Moby Arena. It runs from 9 a.m.-3 p.m.

"It's really intense," said Lucas Wadman, who is graduating in May with a degree in electrical engineering. "Everything comes down to that day."

The College of Engineering requires its undergraduate students to complete a senior design project. Students select an interdisciplinary project and spend the two semesters leading up to graduation working with a team to complete it.

“We want them to take all the material they’ve learned over the past several years and apply their knowledge, logic and technical skills to real-world engineering projects," said Chris Thornton, professor of Mechanical Engineering and director of the Engineering Research Center. "By working in multidisciplinary teams, the groups are given the opportunity to develop technical, communication and social prowess necessary to be successful as young engineers.”

The Design Showcase is open to all. Here are three projects to check out Friday at Moby Arena:

A robotic therapy tool

Physical and occupational therapists often have pediatric patients practice arm movements in front of a mirror so the children can watch themselves do it correctly.

CSU students have built a robotic orangutan called MIMER that mimics a child’s movement and can be used instead of a mirror. The project, which is guided by the Anschutz Medical Campus of the University of Colorado-Denver, is part of a growing field of social robotics.

“It’s a tool physical therapists can use to help their clients meet development milestones,” Wadman said.

Wadman and his teammates built the robot using hobby store motors, an Xbox Kinect motion sensor and other off-the-shelf parts.

The Kinect sensor allows MIMER to detect a child’s movements. That information is then fed into a software program the team created that tells the robot how to replicate that movement.

The robot is child-sized and runs off a customized battery so it is portable.

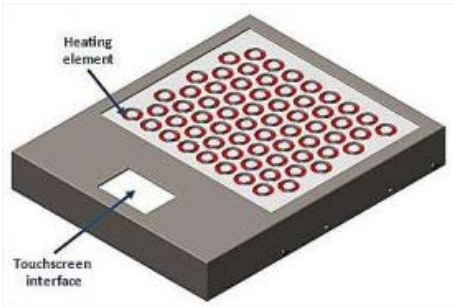
“We wanted to make it something a child would enjoy using,” Wadman said.

A new kind of stove

A basic kitchen stove has four round heating elements spaced across a square cooking area. Higher-end versions might have bridge burners or adjustable circular burners.

But how do you evenly heat square skillets or extra-large or extra-small pots?

Enter HexHeat, a touch-screen “smart” stove with dozens of inch-sized heating elements arranged in a hexagonal pattern so they can accommodate pots and pans of all shapes and most sizes.



Team leader Kevin Thompson came up with the idea while boiling a large pot of noodles for a high school cooking class.

“I just remember thinking that stovetops shouldn’t be so limiting,” Thompson said. “Why are there only four burners and why are they all round? That doesn’t make sense.”

The idea stuck with him through college and last year, as a junior, the electrical engineering major and three of his engineering student friends began working on HexHeat as an independent study project with support from Avago Technologies and Agilent Technologies.

The College of Engineering, Agilent and others are helping to fund the second stage, which qualified as a senior design project. Thompson and his teammates also staged a benefit concert to raise money to support their research and development efforts.

They recently filed a patent for the stove’s design.

A repositionable heart valve

Senile aortic stenosis is an age-related disease caused when calcium builds up on the aortic valve and narrows the passageway, forcing the heart to work harder to pump blood to the body.

To replace the diseased valve, doctors either perform open heart surgery or a newer technique, in which they go through the femoral artery to heart, release an artificial valve and inflate it.

This minimally invasive technique can be used on patients for whom open heart surgery is risky.

But the process still has complications. Once inserted, the valve cannot be moved. And the problematic calcium deposits are left in place.

Two CSU student engineering teams are trying to fixing that.

They have designed and built an artificial heart valve that can be repositioned, and developed a technique to insert the valve and remove the calcified leaflets.

“We can’t do one without the other so the teams have been working together,” said Joslyne Lovelace, a mechanical engineering student on the valve team.

The team created the new valve out of nitonol, a flexible nickel titanium shape memory alloy. To move it, doctors would lace six threads through the stent using a special rod and pull it into place. The valve collapses under the pressure of being pulled and then regains its shape.

The teams have practiced inserting and moving the valve and removing calcium on a pig heart and simulator in a CSU cardiology lab.

“This valve would be inserted a little higher at first so the calcium can be removed,” Lovelace said. “Once that is finished, the valve can be pulled into place.”