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NEWS FROM THE COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

Issue Nine // Fall/Winter 2015

New Cyber Security Center Opens to Educate and Protect

CSUF's newly established Center for Cyber Security in the College of Engineering & Computer Science (ECS) serves as a hub for security-related activities with a goal of establishing ECS as a leader in security education, research, and outreach.

Funded in part by Raytheon, the center will increase awareness of cyber and computer security.

"From job training to education, research, and outreach, the Center for Cyber Security provides expertise about cyber security issues," says ECS Dean Raman Unnikrishnan.

Creating a Talent Pipeline

"Instead of teaching security as an afterthought or as an elective, we will incorporate the topic into mainstream curriculum," Unnikrishnan says. "We will integrate security into the thought and design processes of engineers and computer scientists."

Already, students can take "Introduction to Computer Security," "Cryptography," "Network Security Fundamentals," and "Cloud Computing and Security" courses. Faculty are developing additional courses, including malware analysis, and are working toward establishing an advising track in cybersecurity.

The center will provide outreach to organizations about security issues, as well as technical assistance and security analysis for community and industry organizations. ECS holds an annual Cyber Security Day to further communicate the importance of cyber security. This year's Nov. 13 event featured industry experts and student research presentations.

CONTINUED ON PAGE 2 ›

FROM THE DEAN

"Manufacturing is more than just putting parts together. It's coming up with ideas, testing principles and perfecting the engineering, as well as final assembly." – James Dyson

Dyson, the engineer and entrepreneur of vacuum cleaner fame, often comments on the numerous designs, prototypes, and iterations he and his team test before bringing products to market. He illustrates perfectly the engineering enterprise: define the problem, propose a solution, prototype, test, and repeat.

Our students dive head first into this process within their design projects. For senior design, capstone, computer applications, or collegiate competitions, these projects are often an engineering student's first exposure to problem solving. Engineers learn by doing.

Not long ago, engineers operated in discipline-specific frameworks, completing portions of a process or project before passing it along to an engineer in another silo. Today, engineers differentiate themselves by entering the workforce equipped with interdisciplinary knowledge and experiences.

Our students benefit from this interdisciplinary knowledge transfer when they work together in project-based environments advised by experienced faculty and industry mentors.

Integrated product development engages teams of many disciplines. Their members communicate, present plans, and debate trade-offs. Design projects introduce students to this real-world experience. That is why design projects matter.

This academic year, more than 30 student-led design projects are underway in the college. Student teams requested more than $130,000 to support these endeavors, and the Dean's Office provided $84,000 from private philanthropic sources. We will work to support students with additional fundraising.

As alumni and industry partners, you are essential to our continued capacity to foster these meaningful student projects, and I know we can count on that support in the years to come.

Raman Unnikrishnan, Ph.D.
Dean

New Cyber Security Center Opens to Educate and Protect

CONTINUED FROM PAGE 1 ›

Fighting an Ongoing Battle

"A large portion of the attacks continue to succeed because many technical experts, including software and hardware developers, consistently fail to integrate security into the overall system design," says Mikhail Gofman, computer science professor.

Shawn Wang, computer science professor adds, "One of the best practices in the IT industry is requiring employees to change their password three times a year."

A team of faculty from the Department of Computer Science head the center with Gofman as director, Yun Tian as assistant director of curriculum development, James Choi as assistant director of research, and Shawn Wang as assistant director of outreach.

"When building a website, one cannot afford to be ignorant of the security implications of his or her design and implementation decisions," Gofman says. "A simple bug in a webpage can make a website vulnerable to a variety of attack vectors, including the breach of confidential and private data through XSS attacks and SQL injections."

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MIKHAIL GOFMAN

Unnikrishnan adds, "Research will never go away because when we develop technologies, the 'bad guys' will devise new technologies." This means the Center for Cyber Security is here for the long haul.

Bolstering Security Offensively and Defensively

The Center for Cyber Security currently supports Cal State Fullerton in pursuing certification as a Center for Academic Excellence in Information Assurance Education by the National Security Agency.

"People can protect themselves by spotting threats before they happen."

MOURAD KORDAB

The student club Offensive Security Society (OSS) joined in the efforts to emphasize cyber security by hosting educational presentations, industry information sessions with alumni, collegiate competitions, hacking and counter-hacking workshops, and staged offensive and defensive hack-a-thon events.

"The best way to prepare for hackers is to be a good hacker yourself," says Gofman, the club's advisor. "At OSS, students learn the art of ethical hacking. They use tools and techniques commonly used by real hackers in a safe environment and are taught not to breach ethical and legal boundaries."

OSS members will help reinforce security issues in the college's curriculum, and educate students of all majors about cyber security.

"Whether someone is an art major or learning nuclear defense, people can protect themselves by spotting threats before they happen," says senior Mourad Kordab, computer science major and OSS President.

*While every care has been taken in the preparation of this newsletter, there is always the possibility of error. Please contact Hart Roussel at **hroussel@fullerton.edu** with any questions or concerns.*

Preserving Independence for People with ALS

George's students Aaron Castillo (right) and David Diaz (left) test the headset prototype on alumnus Dean Zarkos (far left).

Kiran George, associate professor of computer engineering, and his students are developing a device that will change the lives of patients dealing with degenerative illnesses such as amyotrophic lateral sclerosis (ALS).

"Fifty million Americans are affected each year with neurodegenerative disorders such as ALS, primary lateral sclerosis, and progressive bulbar palsy," says George. "Most of these patients lose their ability to speak and use their hands – especially in the final stages of the disease. They face tremendous barriers that make electronic communication a challenge, and this inability to communicate is equally frustrating and emotionally devastating."

George's proposed low-cost, brain-computer interface (BCI) electronic communication system would translate users' brain activities into computer commands. Last spring, Cal State Fullerton received a $100,000 grant from the Disability Communications Fund to design and pilot the project.

"Brain-computer-interface (BCI) creates a direct pathway between the brain and an external device," explains George. "Our goal is to enable people with ALS (PALS) to effortlessly access the Internet and engage in electronic communications."

The system's sensors will track thoughts, facial expressions, eye movements, and head movements and allow the user to email, text, chat, and Skype by voluntarily manipulating these bio-signals.

The most challenging aspect of the project is keeping the cost low (less than $200).

"Current systems cost thousands of dollars, so we're exploring alternative designs to find the optimum balance between cost and effectiveness," says George.

The team completed its preliminary prototype design last summer and ran trials with the ALS Association's Orange County chapter – receiving feedback from more than 15 PALS and 20 healthy subjects. In January, they'll train 20 PALS to use the devices in their homes.

50 million

AMERICANS ARE AFFECTED **EACH YEAR** WITH NEURO-DEGENERATIVE DISORDERS

George's brain-computer interface (BCI) electronic communication system needs to cost **less than**

$200

TO BE MARKET-READY

THE SYSTEM'S SENSORS WILL TRACK:

- THOUGHTS
- FACIAL EXPRESSIONS
- EYE MOVEMENTS
- HEAD MOVEMENTS

TO ALLOW THE USER TO EMAIL, TEXT, CHAT, AND SKYPE

PROMOTIONS

Uksun Kim has been promoted to professor of civil and environmental engineering. His expertise includes steel-framed buildings and earthquake engineering.

Pradeep Nair has been promoted to associate professor of computer engineering. His expertise includes power-performance tradeoffs in the nanoscale domain and leakage power reduction in electronic systems.

Sang June Oh has been promoted to associate professor of mechanical engineering. His expertise includes control applications in biomedical engineering, iterative learning, and repetitive control design for aerospace applications.

Kevin Wortman has been promoted to associate professor of computer science. His expertise includes algorithm design and analysis, computational geometry, and applied parallel algorithms in MapReduce or GPU models.

Empowering a New Generation of Female Engineers

Ceal Craig is on an important mission: to help young women become engineers.

Her own journey began when she earned her master's degree in mechanical engineering at Cal State Fullerton in 1978.

"When I started, a female engineer was a novelty," she says.

Craig then launched a stellar career in hi-tech engineering and manufacturing management, working at Rockwell International, Xerox, Blade Network Technologies, Tandem Computers, Siemens, and IBM. She credits CSUF for these opportunities.

Over the years, the number of women in STEM fields is improving, but women remain vastly underrepresented. Craig focuses her attention on finding out why. That question was central to her thesis for her recent Ph.D. in education, a second career, and is a recurring theme in the workshops she holds and research she does across the country.

"Girls are very capable and they have the necessary cognitive skills," she says. "But they just may not have the self-confidence to believe they can succeed in engineering careers. Society, the education system, parents, entertainment, and all the societal messages discourage them from a career in engineering."

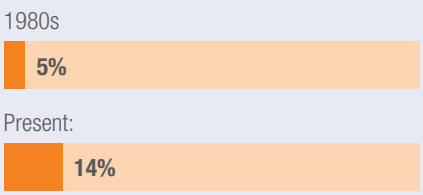
Because of those biases, providing a supportive environment for female engineers is critical, she says. That is why she loves volunteering in the FIRST Robotics Competition℠ (FRC), a mentor-based program that builds science, engineering, and technology skills. Craig also mentors young women through Western Region Robotics Forum, Inc. (WRRF), which hosts robotics competitions for high school teams and robotics workshops in the Bay Area.

"The primary factor that helps change the trend is social cohesion and peer support," she says. "Many of the women I've worked with are in college now, and I'm encouraged by how passionately they talk about that community they first established."

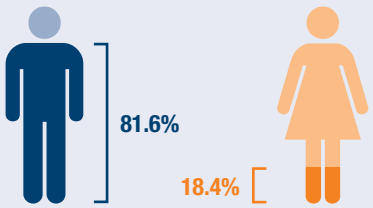
"Girls are very capable and they have the necessary cognitive skills, but they just may not have the self-confidence to believe they can succeed in engineering careers." — CEAL CRAIG

AT A GLANCE: WOMEN IN ENGINEERING

Female Engineers

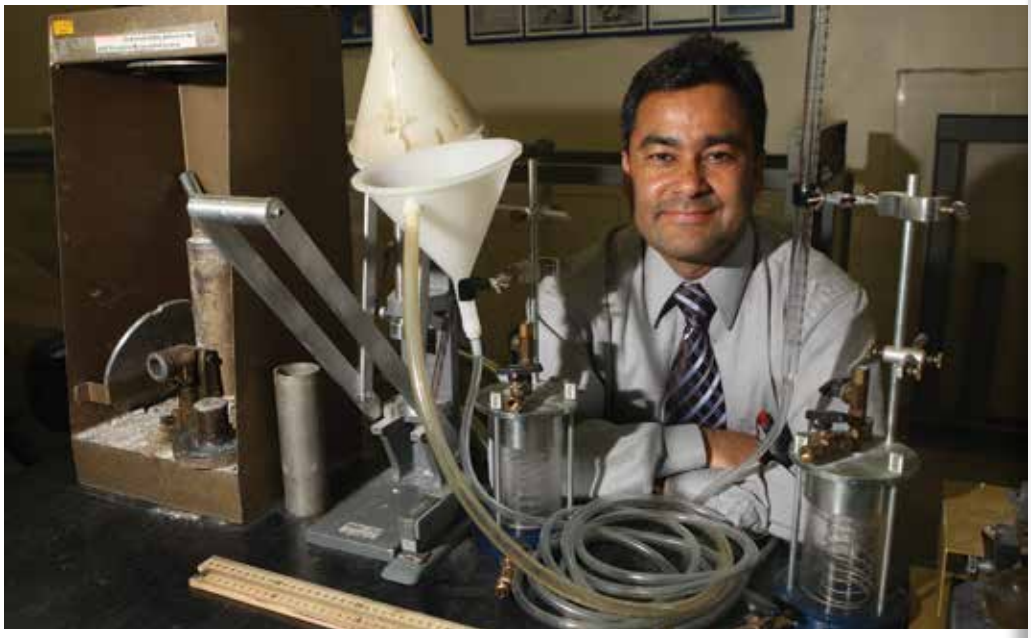


Engineering Bachelor's Degrees by Gender



Sources: Congressional Joint Economic Committee, American Society for Engineering Education

Faculty Focus



Civil and Environmental Engineering Professor Honored for Research and Outreach Efforts

Binod Tiwari was recently promoted to professor of civil and environmental engineering and has also recently received:

- The Outstanding Service Award by the American Society of Civil Engineers Geo-Institute, Los Angeles Chapter, for his service on the organization's board of directors.
- A $29,936 contract from the Cell-Crete Corporation for "Study on Applicability of Cell-Crete Material as an Appropriate Backfill Material for MSE Wall Phase II."
- An invitation to deliver the keynote address this past August at the 13th International Symposium on Geo-Disaster Reduction in Prague. His address, "Geo-disasters Associated with the 2015 Gorkha Earthquake and Lessons Learned for Future Preparedness," focused on his work helping Nepal recover from its powerful earthquake last April.

Tiwari is also faculty adviser to the CalGeo CSUF Chapter, which received the 2015 Rising Star Award from the California Geotechnical Engineering Association.

ENGINEERING PIONEER

Nina Robson, assistant professor of mechanical engineering, was invited as an innovative educator to the National Academy of Engineering's Frontiers of Engineering Education symposium last October.

NEW FACULTY

- **Beena Ajmera**, assistant professor of civil engineering
- **Doina Bein**, assistant professor of computer science
- **Sagil James**, assistant professor of mechanical engineering
- **Anand Panangadan**, assistant professor of computer science
- **Scott Parr**, assistant professor of civil engineering
- **Paulina Reina**, assistant professor of civil engineering
- **Michael Turi**, assistant professor of computer engineering
- **Hope Weiss**, assistant professor of mechanical engineering

RETIRING

Pinaki R. Chakrabarti, professor emeritus of civil and environmental engineering, has retired after 33 years with the department. He served as department chair for 12 of those years. During his tenure, Chakrabarti created a state-of-the-art structural engineering lab, initiated large-scale engineering research projects, obtained several major grants, and published many papers in various fields.

Students and Faculty of the College of Engineering and Computer Science Acknowledge our 2014/2015 Donors and Supporters:

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Student Achievements

Baja Racers Successfully Roar Back to International Competition

For the first time since 2008, a team of CSUF mechanical engineering students raced their Baja off-roading vehicles in an international contest. The Titan team placed 56th overall out of 114 collegiate teams in the Baja SAE competition in Portland, Oregon. One of the team's biggest accomplishments was finishing the four-hour endurance race, which only about two-thirds of teams completed. This year's team is already working on new designs for the 2016 Baja.

The Titan-designed Baja racer is shown here at the 2015 Design Expo.

Students Receive Fellowships for Groundbreaking Transportation Improvements

Civil engineering majors **Daniel Do** and **John Stapleton** received funding for some pioneering and innovative transportation research through the Dwight David Eisenhower Hispanic-Serving Institutions Fellowship Program.

Do's research focuses on cars that can run on magnetic strips rather than gasoline. Stapleton's research focus is improved slope stability on or near highways.

Engineering Students Chosen for Prominent National Civil Engineering Conference

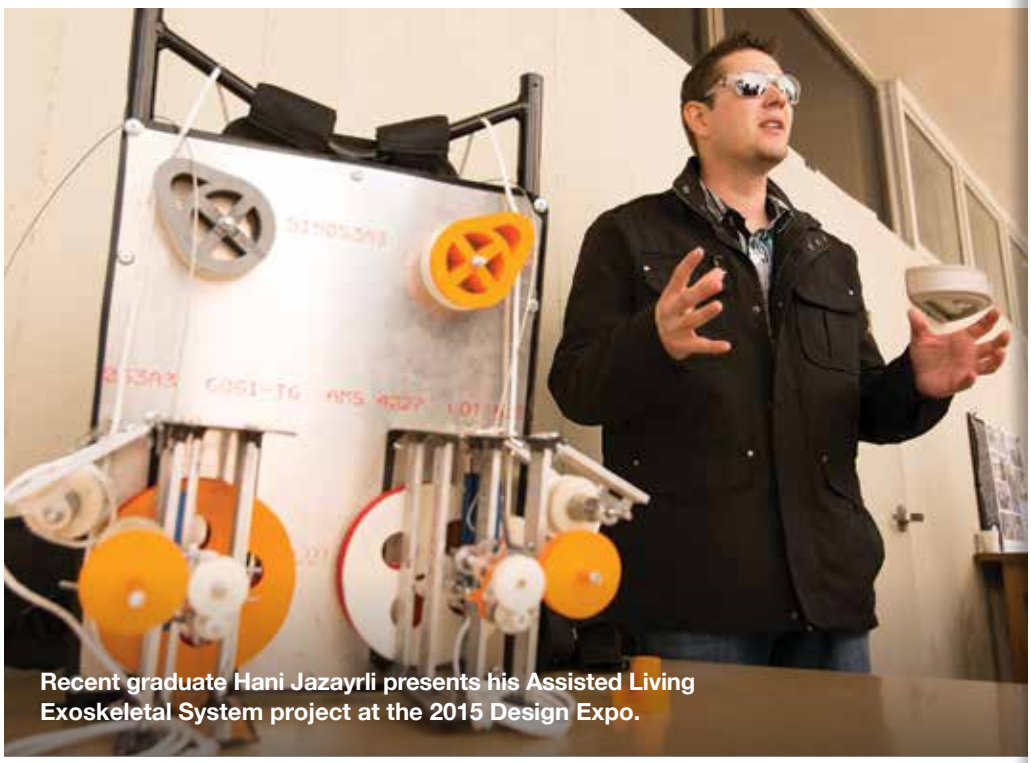
CSUF civil engineering majors **Chloe Gharios** and **Jesus Velazquez** were 2 of just 30 engineering students from across the U.S. selected to participate in Student Days, an annual conference by the Construction Institute of the American Society of Civil Engineers. The program introduces young people interested in civil engineering to professionals in the field and exposes them to major construction projects.

CSUF Engineers Achieve Best Finish Ever in International Aerial Contest

The Titan UAV team placed 11th overall and finished 5th in the flight mission category in the Student Unmanned Aerial System contest at Webster Field in Maryland, their best-ever showing in the competition. Mechanical engineering major and project lead **James Wang** led the Titan team to a fourth-best ranking among U.S. entries and a $1,800 award.

Departments Team Up to Mentor Underrepresented Junior High Students

CSUF engineering students joined business majors in CSUF's STEM-Inc., an after school project with Anaheim Union High School District funded by a $1 million NSF grant to advance STEM learning among underrepresented junior high students. CSUF engineering majors **Jomar Gonzalo**, **Brent Fritz**, **Julio Gallardo**, and **Tim Rotter** joined computer science graduate student **Vindhya Darshan** in mentoring students at Ball, Brookhurst, Lexington, and South junior high schools.



Recent graduate Hani Jazayrli presents his Assisted Living Exoskeletal System project at the 2015 Design Expo.

From Disney to Mars Rover: CSUF Alumni Show Their Projects to a New Generation

In May, recent graduates from CSUF's College of Engineering and Computer Science showed about 200 elementary school students at the Roch Courreges Elementary School in Fountain Valley projects they've worked on. They included **Andrea Clark's** Weld Inspector Optimization for Disney, **Hani Jazayrli's** Assisted Living Exoskeletal System Project, **Tim Hamilton's** iWalk 2.0 Hands-Free Crutch, and **Melanie Valenzuela's** Mars Rover and Machine Tending Project.

The College of Engineering and Computer Science gratefully acknowledges our many generous and thoughtful donors. We regret any errors or omissions to our donor list.

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GOURDS SOARED – Cal State Fullerton's 8th annual Pumpkin Launch this past November captured the attention of thousands who came to witness student and community teams compete in hurling pumpkins from hand-crafted launchers. Live music, hands-on engineering challenges, and gourmet food trucks complemented the team competition. Cal State Fullerton's Society of Women Engineers took third place in the event.

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