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NEWS FROM THE COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

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Driving Innovation for the Next Generation at Raytheon

As world-renowned defense and aerospace electronics manufacturer Raytheon celebrates its 90th anniversary this year, the company is also celebrating the world-class talent that helps it develop innovative solutions for the global market. Laurie Haack (BS '79; MS '06) is an important member of that talent pool.

In her capacity as a software engineering manager within Raytheon's Network Centric Systems (NCS) business, Haack has been a key driving force for her site's internal efforts to support innovation and its commitment to recruit the next generation of engineers and computer scientists.

Haack is no stranger to leading the way – she was the only woman in her first undergraduate computer course. In the first Cal State Fullerton graduating class of the online master's degree program in software engineering, she was named Best Master of Science in Software Engineering Graduate Student. Just a year after graduating with her master's degree, Haack was named one of CSUF's 50 Women of Distinction for her career and life achievements as well as for giving back to the university.

Her 33-year career with Raytheon has been just as distinctive, offering new challenges in research and development, process improvement, training, and innovation.

Pictured Above: Developed by Raytheon and Walt Disney Imagineering, Sum of all Thrills™ lets kids experience math and science in an innovative and exhilarating way: by designing – and then riding – their very own thrill ride.

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Joseph Costantine holds a CubeSat, a nano satellite instrumental in military work and aerospace research.

CubeSat Applications Reconfigure Space Access

From supporting a mission to the Martian moon to monitoring the Earth's atmosphere and providing the world's first real-time look at space weather, CubeSats are rapidly advancing space science and exploration. These miniaturized, or "nano," satellites, which fit in the palm of your hand and weigh little more than two pounds, are spring-launched into orbit for research by the military, private aerospace firms, and universities.

Key to the success of small satellite technology is Joseph Costantine, assistant professor of electrical engineering at Cal State Fullerton. Recipient of the Air Force Summer Faculty Fellowship (AF SFFP) program award for the second year in a row, Costantine bases his research on designing and building feasible deployable antenna concepts for CubeSats.

Technological challenges abound in CubeSat design. One such challenge is ensuring that the satellite remains fully deactivated until it separates from its launch container. Once launched, the satellite must then communicate and respond to commands.

"The antenna has to be able to operate over a relatively wide bandwidth with a reasonable gain," Costantine explains. "The antennas we are currently working on are specifically designed for UHF operation. They must be stowed during launch time and then deployed once they are in space."

Another area of research Costantine is currently investigating involves tuning the operation of deployable antennas. This function allows researchers to accept and reject certain frequencies as well as certain directions of radiation.

Although Costantine's research through the AF SFFP program is focused on CubeSat applications for industry and government, he takes time to work closely with CSUF students who are directly involved in designing their own antenna concepts.

"The students are responsible for designing the antenna structure, verifying that it meets the desired electromagnetic performance, building prototypes of the design concepts, and, finally, measuring these prototypes to verify that they match the simulation concepts," Costantine says. "The students are very excited to come up with their own concepts and then see them come to life once they build and verify their work. It is definitely a very rewarding process."

Constantine explains that the students can perform all of these operations and tasks at the electrical engineering department's labs, thanks to CSUF's practical, applications-oriented curriculum.

"Cal State Fullerton educates students in preparation for graduate school or industry work," Costantine states. "This allows students and faculty to be immersed and more involved in new projects that are the current focus of interest for industry and the research community."

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"Working at Raytheon allows me to participate in a wide range of activities. Recently, I was part of the CMMI [Capability Maturity Model Integration] team for the Raytheon Missiles Systems in Tucson, focusing on the high-maturity aspects of the model," Haack explains. "I'm working on software cost proposals, which is challenging because I have to balance the right technical approach with the appropriate cost and risk level. And, I am the engineering safety champion for the site, which has expanded my perspective regarding how to establish and maintain a safe working environment."

Forward Thinking

Haack is also deeply committed to fostering growth in the next generation of engineers. She led NCS's Engineering Technical Leadership program with the goal to accelerate skills growth for Raytheon's next generation of leaders, and she has taught the Software Program Management course at numerous Raytheon facilities.

Among her most memorable career experiences, Haack counts the day when she witnessed the radar, for which she had developed software, spinning in its dome on a mountaintop in Germany.

"It has been very exciting to join this field in the early days of computer science and be part of its evolution," Haack says. She recalls the days when programming was done via punch cards and paper tape. "We've come so far since I started. It's inspiring to be part of new technologies like smartphone development and advanced radars."

In her various roles at Raytheon, Haack has always been an invaluable advocate for increased Raytheon funding to ECS, including support for the college's Engineering Innovation summer program, scholarships for ECS students, and funding for ECS student projects and collegiate design competitions. She recently championed for Raytheon to become a CSUF Engineering and Computer Science University Member with a $25,000 donation to the campus.

As a CSUF alumna, Haack serves on the MS in Software Engineering program's industry advisory board. She also participates in ECS's Professor for a Day program as part of the University STEM (science, technology, engineering, and math) Initiative. The event brings more than 30 industry professionals to campus as guest lecturers. They share their success stories with students, offering insights and inspiration about careers in engineering and computer science.

"Raytheon uses Six Sigma methods for problem solving, and I shared some of those approaches with the students to uncover questions and concerns the students had about engineering careers," Haack says. "It rejuvenates me to work with the students and remember what it was like when I was first starting out."

Supporting Future Innovators

The relationship between Raytheon and the University is a two-way partnership. The company's corporate-wide STEM efforts include hosting students at the company's campuses for tours and presentations about design, simulation, and manufacturing engineering, and the MathMovesU program. The efforts are all geared to introduce students to STEM careers and encourage them to study STEM courses in high school and college.

"We believe tomorrow's innovators need to be excited by math and science education today. That's why Raytheon created MathMovesU," states Haack.

MathMovesU is Raytheon's ongoing math and science education outreach program. An interactive website, www.mathmovesu.com, shows middle school students that math is literally all around them, revealing the math behind their daily interests, such as sports, fashion, and music.

The site opens a world of math-related opportunities and activities to student explorers, including information on scholarships, contests and giveaways, games, online classrooms, connections to partnering organizations, and even a virtual thrill ride, the Sum of All Thrills,™ which they can design online or in person at Epcot® at Walt Disney World®.

Laurie Haack (BS '79; MS '06) has been a key driving force for Raytheon's internal efforts to support innovation and its commitment to recruit the next generation of engineers and computer scientists.

"We need to help young students make the connection between unique, thrilling experiences, like Sum of All Thrills,™ and math and science," Haack emphasizes. "By engaging young students in interactive experiences, we hope to inspire them to sustain an interest in STEM education."

Haack also actively supports the company's internship programs for high school and college students as well as the Backpack for Kids program where employees donate backpacks and school supplies to community children.

Haack plans to continue her work at Raytheon and with CSUF applying innovative techniques to interest young people in STEM and to encourage engineering students.

"I like to challenge people to move out of their comfort zone and try new roles and responsibilities," she says. "It's very rewarding to watch a student intern transform into a skilled engineer."

New Networking Site Facilitates Project Collaboration Beyond Borders

Pictured Right: **Hasan Almatrouk** (EE '11) has launched a networking site that makes professional collaboration for engineers easy.

When Hasan Almatrouk (EE '11) graduated last year, he not only received his degree, but also launched a networking site that has fellow engineering students showcasing and collaborating on projects and competing for cash prizes.

While the site works much like other social networking venues, it is focused on the professional and creative aspects of project design. Log on to www.YesYous.com and you will find details of multiple projects including a next-generation RFID sensor, a reconfigurable microstrip patch antenna, and a LEED-certified hydroponics market.

While the site allows users to showcase projects, it also makes collaboration easier and effectively connects creative developers around the world. It also offers serious creators a professional venue to show off.

"This has been a remarkable year and YesYous has started to gain popularity," says Almatrouk. "I get a lot of emails from students thanking me for giving them an opportunity to display their projects in order to boost their chances to get a job or get into master's or Ph.D. programs."

By posting a project on YesYous, students can document project progress, and safely direct professional inquiries about their experience and work to the site. The site's simple organization and polished presentation make it a magnet for employers to use when considering job candidates.

The site also makes it seamless to discuss project functions and to collaborate on improvements. Hend Almatrouk and Gijo Paul George, founders of Studio Toggle in Vienna, Austria, have gained an international following because of their use of YesYous. The design cooperative that focuses on logical design and problem-solving techniques in architecture and urban design regularly posts its projects on the site. It has engaged in project discussions with people from Kuwait and Japan, and has gathered potential employees from Germany and Austria.

"They get a lot of visits, tweets, and Facebook likes as soon as they add another project to YesYous," says Almatrouk.

As a way to promote the site's features, Almatrouk initiated competitions for students at CSUF, UC Berkeley, UC Irvine, University of San Diego, and Loyola Marymount University, with site users acting as judges to award monetary prizes for best projects.

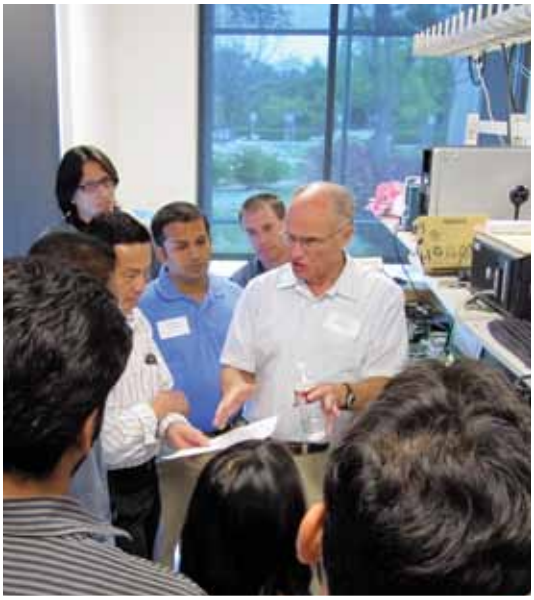
"This gives students an incentive to post projects to the website, add teammates to the projects, and see how easy the site is to use," he says.

Next for Almatrouk is phase two of the YesYous functionality. "We are currently working on expanding the collaborative function of the site in order to make it easier to facilitate discussions," he says. "I want to support education and help students show their creativity, skills, and abilities to analyze and execute. I believed in this concept and am very proud to see it proven."

Computer Engineering Students Gain Access to Leading-Edge Technology Thanks to Emulex

Emulex Corporation has donated nearly $850,000 of advanced integrated circuit design equipment to the university, the largest corporate donation received by the college to date. The donation includes four HAPS FPGA emulation systems, software applications, lab support, and technical training on the equipment.

Pete Fiacco (MSEE '91), Emulex vice president of ASIC Engineering, facilitated the in-kind gift to the college's computer engineering program. "I am impressed with the growth of the computer engineering program and the accomplishments of the students and faculty," he said.



Emulex FPGA Engineers **Craig R. McElheny**, **Eric Peel** and **David Nguyen** review schematics for the HAPS FPGA emulation systems donated to ECS, while faculty and students look on.

Alumni Brothers Design with the Power of Modern Engineering Technology

Alumni Steve and Rick Ellingson carry on the family tradition of machining precision parts for the aerospace industry.

Although its offices and facilities are located in historical Fullerton landmarks, Ellingson, Inc., works on the cutting edge of the latest manufacturing technology to machine precision parts for the aerospace industry.

Led by alumni, President Rick Ellingson (BSME '75) and Vice President Steve Ellingson (BSEE '72; MSEE '77), the company was started in 1946 by their father, Thomas C. Ellingson, a World War II Marine fighter pilot. After the war, Thomas combined his interest in aircraft and flying with his pre-war education and experience to create his company.

Today, Ellingson is the classic southern California manufacturing and aerospace success story, producing housings and bodies for flight control actuators, filtration manifolds, and air/fuel receptacles. Their machined valve actuators are used in the main engines of the space shuttle, and their products have been used in helicopters manufactured by Sikorsky and Bell Helicopter. Recently, they have machined from solid aluminum forgings the main hydraulic filter manifolds for the new Agusta-Westland AW169 helicopter and a flight control actuator for the Boeing F-18 fighter aircraft.

"All of these products were machined on five axis machining centers that we retrofitted in-house with Mitsubishi CNC systems using brushless AC servomotor technology," Steve explains.

Innovating for Excellence

In order to program these CNC (computerized numerical controlled) machines, the Ellingson company uses a CAD/CAM system (Siemens NX8) that enables the programmer to view complicated part geometry deep inside the flight hardware components even before they have made the first cuts on the machine. In addition, the brothers designed a system of in-process inspection that closely monitors supercritical measurements at each stage of machining.

"We do this with a full servo drive CMM (coordinate measurement machine), which uses selectable touch-sensitive probes to measure all critical part features," explains Steve.

The company is also certified as an FAA repair station and has developed a process control system that ties in with the aerospace quality management standard AS9100 Revision C. The value of these systems and processes is reflected in the near-zero reject rates from Ellingson's customers.

"Occasionally, we are invited to our customers' facilities to see our machined components as they are in final assembly and ready to install into the aircraft," Steve says. "I still get a special thrill at seeing our hard work result in products people rely on to safely operate their aircraft."

The CSUF Connection

Both Steve and Rick apprenticed under their father as mold makers in the machine shop while they attended Cal State Fullerton.

"The ability to establish relationships with our professors was very influential on my brother and me," Steve recalls. "Rick excelled in his major of mechanical engineering. I, too, had initially chosen that major, but my electrical circuits' professor, Jack Kemmerly, was instrumental in my decision to switch to electrical engineering, a choice which directly impacted the success of our company."

The Ellingson brothers maintain a strong connection to CSUF, having donated equipment, acted as advisory board members and alumni mentors, and employed CSUF mechanical engineering students and graduates.

Steve cites three characteristics as essential for success as an engineer: intellect, motivation, and attention to detail. In addition, he encourages engineering students to put themselves in an environment where they are exposed to as much as possible.

"By experiencing as much as you can, you will develop an understanding of what it takes to build or manufacture your designs and dramatically increase your value as an engineer," he emphasizes.

Student Achievements

Engineering students mow down the competition

A team of seven engineering students took first place in the 2012 ION Robotic Lawn Mower competition (static category) this June. The robotic unmanned lawnmower the team created also won the Fantastic Award for its stylish look and the Outclock Award for efficient use of computer technology. Team members included graduate students **Michael Yeh** (Team Lead), **Bao Nguyen**, **Riyad El-laithy**, and **Jared Che**, and undergraduate students **Tuo Wu**, **Minh Tran**, and **Vy Phung**.

Titan V competes in 2012 Formula SAE West

Prototype race car Titan V placed well in the 2012 Formula SAE West competition despite a late-event part failure in the grueling endurance event.

Pictured above: (left) **Michael Crull**, **Ben Lahiji**, **Kalen Eidenschink**, **Kurosh Jozavi**, **James McCollum**, and **Danny Rivera**. *Photo: Matt Gush*

Students excel in competitions

Congratulations to these competitors in the 26th annual CSU Student Research Competition at Cal State Long Beach: **Richard Hastings** (CE '12) for first place, and **Alexander Lemmon** (CE '12) for second place in the undergraduate engineering and computer science category; **Beena Ajmera** for second place in the graduate engineering and computer science category.

Graduate students **Adam Lewis** and **Beena Ajmera** and senior **Mark Principe** (CE '12) won a third-place award in the Google Map Maker University Mapping Contest for their campus map makeover.

Andrew Soltan (CS '12), **Troy Stump** (CS '12), **Emily Chiang** (CS '12; ART '12), and graduate student **Fidel Cabezas** won the "Best Windows Phone Game" at the first IEEE GameSIG Intercollegiate Computer Game Showcase competition this spring, for their game, "A Ruff Day."

The Cal State Fullerton student chapter of the California Geotechnical Engineers Association has been awarded the organization's 2012 Rising Star Award.

First Yesyous.com competition winners named

The CSUF intercollegiate competition sponsored by project networking site YesYous.com attracted 13 projects for student judging. The top three winners were:

- The **CSUF Unmanned Utility Ground Robotic Vehicle project**, which won first place and a prize of $1000.
- The **CSUF Formula SAE 2012 project**, which won second place and a $500 prize.
- The **Preliminary Investigations into the Ambient Electromagnetic Radiation in Orange County and San Diego project** conducted by Electrical Engineering senior **Myles Cupp**, won third place and a $250 prize.

Congratulations scholars

Mark Principe, **Kelby Styler**, **Suzanne Moubayed**, **Alex Lemmon**, and **Ujjwal Pandey** were awarded 2012 Dwight David Eisenhower Hispanic Serving Institutions (HSI) Fellowship Grants.

Qing Xie was named a 2012–2013 Sally Casanova Pre-Doctoral Scholar.

Faculty Achievements

Faculty members honored

Kiran George, assistant professor of computer engineering; **Sang June Oh**, assistant professor of mechanical engineering; **Christopher Ryu**, professor of computer science; and **Binod Tiwari**, assistant professor of civil and environmental engineering have been honored for their service to the campus and community.

Grant to support professor's research in assistive technology

Kiran George, assistant professor of computer engineering, has been awarded the Junior Intramural Research Grant to pursue scholarly activity in "Neural Signal Based Assistive Technology for Spinal Cord Injury."

Outstanding IT staff member

Thao Nguyen, an information technology consultant for both the civil and environmental engineering and mechanical engineering departments, has been named one of three Outstanding Staff Award recipients this year.

Faculty member speaks at IEEE Computer Society meeting

Michael Shafae, assistant professor of computer science, spoke at the IEEE Orange County Computer Society this spring on the topic of the Apple iOS platform. He provided attendees the skills necessary to immediately develop games that can be sold on the Apple App Store.

Welcome new tenure-track faculty joining ECS in fall 2012

Mikhail I. Gofman, Ph.D. *(Computer Science)* from the State University of New York at Binghamton.

Phoolendra Mishra, Ph.D. *(Civil and Environmental Engineering)* from the Los Alamos National Laboratory.

Nina P. Robson, Ph.D. *(Mechanical Engineering)* from Texas A&M University.

Garrett Struckhoff, Ph.D. *(Civil and Environmental Engineering)* from the Air Force Institute of Technology, Dayton, OH.

Haowei Wang, Ph.D. *(Mechanical Engineering)* from the Rensselaer Polytechnic Institute, Troy, NY.

NSF research grant awarded

The National Science Foundation, in conjunction with the National Earthquake Hazard Reduction Program, has awarded more than $920,000 in grant funding to a team of engineering researchers, including **Binod Tiwari**, assistant professor of civil and environmental engineering. The primary objective of this project is to develop a new seismic design concept for reinforced ground that can be used to reduce the intensity of strong ground shaking on soft sites.

Transitions

Roberta Rikli will continue as acting chair of mechanical engineering for the 2012/2013 AY.

Uksun Kim will serve as the department chair for civil and environmental engineering succeeding **Prasado Rao**.

Shawn Wang will serve as the department chair for computer science succeeding **Mariko Molodowitch**.

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September 20: ECS Affiliates Technology Breakfast Series
Bolts, Jolts & Volts: Ensuring Reliability in Electrical Transmission with Dewan Jamir, Senior Electrical Engineer, Burns & McDonnell

November 8: ECS Affiliates Technology Breakfast Series
Urgent Issues in Cyber Security with Dr. Ron C. Williamson, Senior Engineering Fellow, Raytheon

November 10: 2012 Pumpkin Launch
(Rain or Shine) 9 a.m. – 12:30 p.m. Titan Athletic Field

February 7, 2013: ECS Affiliates Technology Breakfast Series
Engineering Challenges in Building the Mars Curiosity Landing Radar with Scot L. Stride ('02), Senior Engineer, Spacecraft Transmitter Systems, NASA/JPL

April 11, 2013: ECS Affiliates Technology Breakfast Series
Advanced Off-Grid Generation Technology and Utility Regulation with Lisa Cagnolatti, VP, Business Customer Division, Southern California Edison

For information about these and other ECS events, please visit Fullerton.edu/ecs or contact Hart Roussel, hroussel@fullerton.edu, 657.278.5429.

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