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Pictured Here:
Kiran George, assistant professor
of computer engineering, reviews results
of a high performance computing experiment
with a computer engineering student.

CONNECTION

NEWS FROM THE COLLEGE
OF ENGINEERING AND
COMPUTER SCIENCE

Issue Four // Spring // 2013

Unique Dual Degree Program Approved

While plenty of schools offer five-year bachelor's/master's degree programs in computer engineering, CSUF students with motivation and drive can now earn a dual degree in only four years. The four-year combined BS and MS degree program plans to enroll students for fall 2014.

"With each passing day, society demands more digital innovations. We need more and more computer engineers with strong theoretical backgrounds and practical training in computer-based applications," explains

Susamma Barua, associate dean of the College of Engineering and Computer Science. "To meet that demand, it makes sense for Cal State Fullerton to offer an accelerated, integrated BS and MS degree program."

The comprehensive, cohort-based program parallels the fast pace of technological advancement. Students who apply for the program must complete three Advanced Placement courses before gaining admission. Students also enroll in summer sessions in their first and second years to complete the 153 units required to earn both degrees.

"The program is not designed to accommodate a light workload. Rather, it can facilitate a fast track to academic and professional success," says Kiran George, Ph.D., assistant professor of computer engineering, who spearheaded the dual degree proposal. "The degree program, which primarily focuses on integration of both hardware and software aspects of computer-based systems, will prepare students for leadership role careers in industry, government, and educational institutions."

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“I like working on the cutting edge of technology, both for commercial and Department of Defense uses. I always wanted to teach, so after finishing my Ph.D., I applied to teach at Cal State Fullerton.”

Mohinder Grewal
Professor of Electrical Engineering



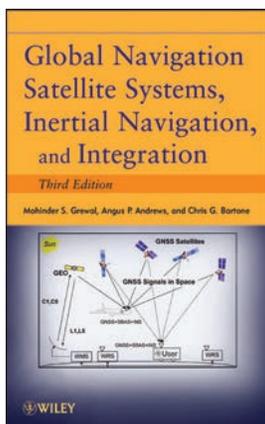
The Navigator: Making Sure the World Finds its Way

The ubiquitous nature of GPS transcends cultural and political boundaries. It enables people to find a store or restaurant and track freight. It helps law enforcement locate missing people. It allows the military to fly aircraft, guide ships, position troops, and operate drones (unmanned aircraft). This successful worldwide use of GPS is the work of scientists like Mohinder Grewal, a professor of electrical engineering at Cal State Fullerton and internationally recognized authority on applying Kalman filtering to navigation systems.

The key component that makes GPS effective is a mathematical algorithm known as Kalman filtering. Thanks to Grewal's refinements of this algorithm, aircraft can now be landed using GPS alone.

“You just can't have a 10-meter altitude error when an airplane is landing,” Grewal points out.

The Kalman filtering algorithm is used to estimate satellite positions, clock biases, and drifts. It is also being applied to estimate delays caused by radiation bursts from the sun (ionospheric error delays). Grewal applied his algorithm refinements to Space-Based Augmentation Systems (SBAS), which make use of multiple satellites and ground stations for very accurate positioning information. His groundbreaking work in SBAS was approved by the Federal Aviation Administration (FAA) in 2003 and works with 31 GPS satellites orbiting Earth.



Grewal is principal author of *Global Navigation Satellite Systems, Inertial Navigation, and Integration*.



Grewal holds two patents with a third patent application pending for algorithms related to global positioning and navigation. In 2007 and 2008, he was named by *GPS World* as one of the “50+ Leaders to Watch” for advancements in space-based positioning, navigation, and timing systems.

After earning his Ph.D. in electrical engineering at USC, Grewal joined the Cal State Fullerton faculty in 1975. He has won numerous awards for his teaching and research, including the 2011–2012 Outstanding Educator Award from Associated Students, Inc. (ASI); the 2009 Distinguished Engineering Educator Award from the Orange County Engineering Council; and the 2008–2009 Outstanding Professor Award from Cal State Fullerton.

“It’s very interesting to work with Cal State Fullerton students,” Grewal says. “I found it particularly rewarding to work with a student to develop a new implementation algorithm in the area of navigation.”

Grewal enjoys following his students’ work as they develop careers: “Most of my Cal State Fullerton students who took GPS and Kalman filtering classes and completed their theses in the navigation/GPS field are now working at Raytheon, Boeing, Interstate Electronics (L3), and Northrop Grumman. Some of them are now chief engineers and program managers.”

Grewal himself began working at McDonnell Douglas Aircraft in Long Beach, Calif., when he started his Ph.D. studies at USC. He continued his consulting relationship with McDonnell Douglas as the company increased its use of an inertial navigation system in navigating aircraft. His dissertation focused on his development of the new algorithm applying Kalman filtering to a parameter identification problem.

“I like working on the cutting edge of technology, both for commercial and Department of Defense uses,” Grewal explains. “I always wanted to teach, so after finishing my Ph.D., I applied to teach at Cal State Fullerton. As much as possible, I stayed in touch with state-of-the-art developments in navigation. My real world experience provided the basis for starting

several new graduate courses, including two in GPS. We also established our own GPS lab, one of very few on the west coast, with donated equipment from NovAtel.”

In addition to authoring and co-authoring dozens of articles and papers on navigation and global positioning, Grewal shares his expertise through presentations, lectures, and seminars. His first book, originally published in 1993, is *Kalman Filtering: Theory and Practice Using MATLAB®* which he co-authored with Angus P. Andrews, a retired Rockwell senior scientist. The book, published by John Wiley & Sons, is now in its third edition.

Grewal is also principal author of *Global Positioning Systems, Inertial Navigation, and Integration*, which he co-authored with Lawrence R. Weill, Cal State Fullerton emeritus professor of mathematics, and Andrews. The book, also published by John Wiley & Sons, is a guide to global navigation satellite and inertial navigation systems. Grewal is currently working on extensive revisions for a fourth edition of this book because, as he says, “the technology is changing so fast.”

“GPS is used in everyday life,” Grewal says, “in cell phones, automobiles, geocaching, hiking – even golf – as well as in commercial aircraft and national security. This book addresses applications and integrity issues that are critical to our safety and well-being.”

“I am also excited about working on mitigation of errors in satellite signals to ensure integrity of the navigation system,” Grewal adds. “New GPS satellites called Block III are being designed that will have more civilian frequencies. I’m also staying involved with the update in SBAS for the FAA.”

Grewal recently became a project reviewer for the Academy of Finland, a part of Finland’s Ministry of Education. The academy underwrites top research projects, institutions, and universities in Finland and invites those with international reputations in their fields to be reviewers. Grewal is reviewing a project aimed at making satellite positioning more accurate indoors. ☺



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The new combined degree program is expected to meet increased industry demands for talented and skilled computer engineers.

The demand for such programs has grown exponentially due to both the inherent attractiveness of accelerated degree programs and the current economic climate in which technical retraining has become imperative,” says George. “Not only will this program provide an alternative that saves time, money, and resources, but the implementation of the program will give students special opportunities for practical, hands-on experience in professional settings.”

There are additional program benefits for students who enroll in the program.

“To ensure the success of its participants, the program offers students opportunities for exclusive internships and scholarships,” says Barua. “We plan to offer internships to third-year students through partnerships with industry affiliates such as Boeing, Raytheon, Unisys, Emulex, and Western Digital. Also, 10 full tuition scholarships will be available to students for the duration of their enrollment to help them focus more diligently on their academics.”

Thirty qualified students are expected to enroll in the first years of the program, with expansion planned as the program gains resources and grows in popularity.

“Two years since its conception, the program proposal received almost unanimous approval from all levels of review at Cal State Fullerton,” says Barua. “We are very pleased to see the transformation from a proposal to an approved dual degree program.” ☺



Motivated Provost Leverages Background in Electrical and Computer Engineering

A veteran computer engineering researcher and teacher, accomplished academic program administrator, and champion of educational equity in higher education, has been named the University's new provost.

José L. Cruz brings a fresh vision and enthusiastic spirit to the position of provost and vice president of academic affairs. He will oversee and advance the interests of undergraduate, graduate, and professional education at Cal State Fullerton; advocate for academic priorities; oversee the recruitment and retention of faculty; and marshal resources in support of excellent teaching, research, creative production, and service.

“Having dedicated my life to improving educational attainment, I welcome the challenges that await me,” says Cruz. “Every challenge brings opportunities and I am excited to work with the campus community to turn those opportunities into solutions that will help advance our institutional goals.”

High on his list is helping every department to implement initiatives that will help the University become recognized as a national model comprehensive university that prepares a diverse student body for academic and professional success. Those initiatives will help attract and retain traditionally underserved students.

“We must better serve all our students, including the traditionally underserved, if we are to once again lead the world in educational attainment, opportunity, and social mobility,” he says.

Though he has served as Cal State Fullerton's provost for less than six months, Cruz is convinced that the campus is well-positioned to become a national model comprehensive university.

“I am enthusiastic to be a part of Cal State Fullerton's contributions, which I believe will help recover America's position as a global

leader in education,” he says. “We will demonstrate that it is indeed possible to expand access, improve quality, increase degree completion rates, and keep costs low for high-demand academic programs such as computer engineering.”

Working toward such ambitious objectives may seem like a daunting challenge, but if anyone can rise to the task, it is Cruz. Prior to his appointment as provost, he was the vice president for higher education policy and practice at The Education Trust, a national research and advocacy organization that promotes equity-minded educational policies and practices. He previously served at the University of Puerto Rico-Mayagüez as a tenured professor of electrical and computer engineering and associate director and chair of the Department of Electrical and Computer Engineering, as well as dean of academic affairs.

As a National Science Foundation Career Award recipient and patented inventor, Cruz is no stranger to the challenges associated with computer engineering.

“A major challenge is educating engineers who can bridge the chasm between fundamental knowledge at the nanoscale and the application of this knowledge to the grand challenges facing society in the areas of health, energy, and sustainability,” he says.

Eager to apply new concepts to these challenges, Cruz advocates cutting-edge practices in computer engineering instruction.

“Among the trends emerging in computer engineering education is the strategic integration of information technology to accelerate learning, deepen understanding, and socialize knowledge,” explains Cruz. “As provost, I will enthusiastically support the most relevant trends to teaching this exciting and ever-evolving discipline.”

José L. Cruz
Cal State Fullerton University Provost

“I am enthusiastic to be a part of Cal State Fullerton's contributions, which I believe will help recover America's position as a global leader in education.”

ECS Lab Upgrades Benefit Students

Over the last two years, ECS has methodically but steadily upgraded the hardware and software available to students in our engineering computer labs. ECS has both increased the number of computer stations available to students and invested in industry-standard software. Improvements have been made with an eye toward providing students access to the most common applications and software they will encounter in their future workplaces.

Primarily located in the Computer Science (CS) building, these labs are used by students in civil and environmental engineering, computer engineering, computer science, electrical engineering, and mechanical engineering. Labs feature LCD monitors and networked printers.

Electrical & Computer Engineering

CS-406 is home to 21 stations with faster processors, increased memory, and up-to-date operating systems running industry-standard software packages by Synopsys, Mentor Graphics, National Instruments, and MathWorks. Four HAPS FPGA Emulation systems donated by the Emulex Corporation facilitate faculty research and student projects.

Civil & Environmental Engineering

CS-204 is home to 40 stations featuring new Dell Precision T3500 computers with Intel Quad core Xeon with 6GB of RAM and 24-inch LCD panels. These stations feature the latest software for civil and environmental engineering including: AutoCAD 2012, Etab, SAP 2000 version 15, Bentley Microstation, RAM connection, RAM Structural System, ANSYS 12.1, ARCGIS 10.1, LabView 2010, MatLab 2011, Mathcad 15, and Multisim 11.0.

CS-207 boasts 50 Dell Precision T3500 stations with Intel Quad core Xeon with 6GB of RAM and 24-inch LCD panels. These stations feature the latest software for civil and environmental engineering including: AutoCAD 2012, Etab, Bentley Microstation, RAM connection, RAM Structural System, SAP 2000 version 15, and ARCGIS 10.1.

Computer Science

CS-101, known as the Apple lab, boasts 31 stations running Lion (OS X 10.7) and is primarily used for iOS device application

development. This lab recently upgraded to Mountain Lion and iOS 6.

CS-104 is a Windows 7 64-bit based lab with 32 stations.

CS-200 is a 32 station open lab running industry-standard software packages by MathLab, LabView, AutoCAD, and Solidworks capable of supporting numerous courses in both the computer science and computer engineering programs.

CS-202 is the 29 station Linux-Ubuntu lab supporting core and elective Linux courses in the computer science curriculum.

CS-408 hosts 31 stations running Windows 7 64-bit for courses requiring 64-bit compilers and architecture.

Mechanical Engineering

CS-304 hosts 48 stations featuring the new Dell Precision T1500 computers with Intel i5 Quad core with 8GB of RAM and 22-inch LCD panels. We have all of the latest software for mechanical engineering such as: AutoCAD 2012, SolidWorks 2011, ProE 5.0, LabView 2010, MatLab 2011, Mathcad 15, and ANSYS 12.1.

As resources become available, ECS will continue to improve labs to deliver an up-to-date learning environment for students and to give them a competitive edge as they prepare for their careers. Please consider supporting ECS lab upgrades with gifts-in-kind and through charitable giving. ☺



The **CS-207 lab** was upgraded with 50 Dell Precision T3500 stations.



Computer stations in the **CS-204 lab** feature the latest software for civil and environmental engineering.



The **CS-304 lab** now features 48 computer stations with the latest software for mechanical engineering.



In The News

Software Engineering Program Ranks Tenth in Nation

Cal State Fullerton's online graduate program in software engineering has received top ranking from U.S. News & World Report. Among 70 schools evaluated, it ranks No. 10 on the list of "2013 Best Online Graduate Engineering Programs." Offered since 2004 by the Computer Science Department, this online master of science degree program in software engineering ranks No. 3 among its peers for student services and technology and No. 6 for faculty credentials and training.

Communication Skills Seminar for Engineers

Caecilia Gotama, (B.S. '82, M.S. '86) owner of Gotama Building Engineering, Inc., produced a communications skills workshop this winter for undergraduate and graduate students majoring in engineering or computer science. Topics included how to become more competitive in the job market and how to develop skills in working and communicating with different personality types.



Alumnus Discusses His Work on Mars Rover

Scot Stride (EE, '02) (*pictured below*) recently discussed the engineering challenges of building the Mars Curiosity landing rover at the spring Technology Breakfast. Stride works with spaceflight and telecommunications hardware, including flight telecommunications and radar hardware for several NASA missions. He is currently working on the soil moisture active passive project, a satellite set to launch in 2014. The satellite will feature ground-penetrating radar that will provide global measurements of soil moisture to provide improved flood prediction and drought monitoring capabilities.

Student Achievements

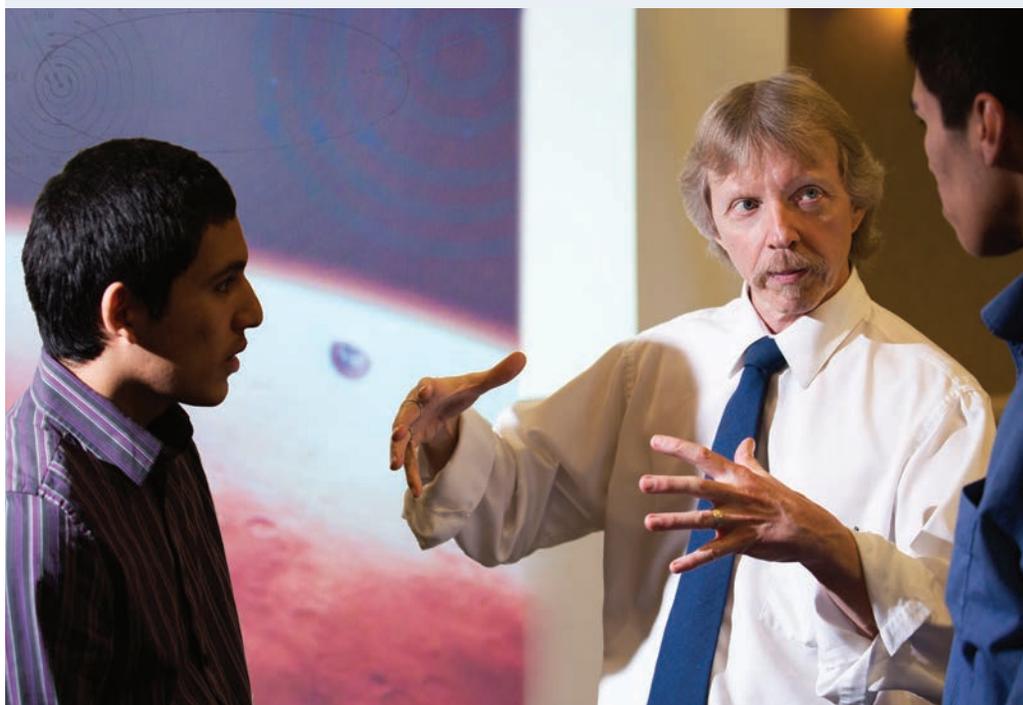
TITAN V EXHIBITED AT L.A. AUTO SHOW

Cal State Fullerton's Titan Formula SAE (Society of Automotive Engineers) team members displayed their formula-style race car "Titan V" at the 2012 L.A. Auto Show at the Los Angeles Convention Center (*pictured above*). Student members of the college's Society of Automotive Engineers and American Society of Mechanical Engineers student chapters were on hand to talk about the race car, the FSAE program, and to promote engineering. The team will compete in the Formula SAE with its new Titan VI June 19–22 at Lincoln Airpark in Lincoln, Neb.

VIDEO GAME CLUB PREPARES FOR CHALLENGES

Video Game Design Club members will compete at both the second annual IEEE GameSIG competition and the Microsoft Imagine Cup. At GameSIG, student teams will compete for the Student Game Cup by submitting computer games they have developed to be judged by a panel of game industry leaders. The showcase will also feature presentations and live game play demonstrations by competition finalists. At the Imagine Cup, two club teams will tackle the competition's five major technology challenges, including software design, to create projects that address the Imagine Cup theme: "Imagine a world where technology helps solve the toughest problems."

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Faculty Achievements

Faculty Research in Water Resources Issues Win Funding

Phoolendra K. Mishra and **Garrett Struckhoff**, both assistant professors of civil and environmental engineering, have received this year's CSU Water Resources and Policy Initiatives Faculty Research Incentive Award to pursue projects devoted to water resource-related issues. Mishra's project will focus on developing ways to find the source or cause of groundwater contamination. Struckhoff's project is focused on developing an undergraduate course curriculum based on best management practices used by Southern California municipalities and industries that provide water.



Phoolendra K. Mishra,
Assistant Professor of
Civil and Environmental
Engineering



Garrett Struckhoff,
Assistant Professor of
Civil and Environmental
Engineering

Research Underway to Increase Female STEM Faculty

Susamma Barua, associate dean of the College of Engineering and Computer Science, will support two other CSU Fullerton faculty members in research to launch a campus-wide effort designed to increase female sciences, technology, engineering, and mathematics (STEM) faculty recruitment, hiring, promotion, and retention. Their research will assess campus climate and culture with respect to hiring, promoting, and retaining female STEM faculty, and identify policies and practices that hinder the hiring and promotion of female STEM faculty.



Susamma Barua,
Associate Dean of the
College of Engineering
and Computer Science

Engineer and Author Honored

Mohinder S. Grewal, professor of electrical engineering, was honored along with 46 other faculty members at Cal State Fullerton's 13th annual Author Awards event. He has co-authored a new book, *Global Navigation Satellite Systems, Inertial Navigation, and Integration*, along with Angus P. Andrews and Chris G. Bartone.

Research Grants Awarded

The following faculty members received 2012–13 Incentive Grants from the Office of Graduate Studies and Research:

- **Joseph Costantine**, assistant professor, electrical engineering, for his research on reconfigurable wearable antennas.
- **Binod Tiwari**, assistant professor, civil and environmental engineering, for his research on the use of recycled materials in civil engineering applications.



Binod Tiwari,
Assistant Professor,
Civil and Environmental
Engineering



Joseph Costantine,
Assistant Professor,
Electrical Engineering

Student Achievements (cont.)

GRAD STUDENT RECEIVES INSTITUTE OF NAVIGATION SCHOLARSHIP

Electrical engineering graduate student **Michael Yeh** (EE, '11) is the first recipient of the Kevin Rudolph Memorial Scholarship from the Southern California Section of the Institute of Navigation. Yeh will receive a \$2,500 scholarship award, which he credits to support from his electrical engineering faculty mentors, Mohinder S. Grewal, Jidong Huang, and Mostafa Shiva.

STUDENTS WIN IN NATIONAL GEO-CONGRESS COMPETITION

Cal State Fullerton civil and environmental engineering students were first place winners in the 2013 American Society of Civil Engineers' Geo-Congress geotechnical completion in April, besting Cal Poly San Luis Obispo, Cal Poly Pomona, and UCLA. The team secured its spot to compete by winning national finalist placement in the 2013 American Society of Civil Engineers' Geo-Challenge earlier in the year:

- CSUF's "Geo-wall" team tied for third with UCLA for its design report. The team members are: seniors **Alex Lemmon** (CE, '13) and **Kelby Styler** (CE, '13), **Suzanne Moubayed** (CE, '13), and **Michael Ayad** (CE, '14).
- The "Geo-prediction" team of Ayad and graduate student **Santiago Caballero** (CE, '14) predicted the behavior of a real-world geotechnical system and calculated the level of ground water at the time of a slope failure to place fourth.
- "Geo-poster" research winners included **Beena Ajmera** (M.S. '12), who finished in third place for research she performed on the evaluation of the strength of soil at a very shallow depth, and graduate student **Sneha Upadhyaya** (M.S. '13), who finished seventh for her evaluation of a cause of a massive landslide that collapsed a building.



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Boeing Next Generation Scholarships



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Special thanks to The Boeing Company for their most recent gift of \$70,000. Each year since 1997, through a series of annual grants, Boeing has given more than \$1 million to Cal State Fullerton for student scholarships in engineering and business, as well as to support engineering programs. Students receiving Next Generation engineering scholarships are encouraged to apply for summer internships with Boeing. These internships often serve as paths to employment with the company.



Pictured here is **Bill Purpura**, senior systems engineer at Boeing, who made the check presentation at the annual ECS Donors, Advisors, and Scholars Reception in December. He is pictured with engineering students (*left to right*) Katie Soto, Manuel Nieto, Michael Stragier, Michael Gustafson, Lexi Schaffer, Nathan Cobb, Javier Lichtscheidl, Tyler Hailey, and Alex Lemmon. ☀

DEAN:

Raman Unnikrishnan, Ph.D.

ASSOCIATE DEAN:

Susamma Barua, Ph.D.

ASSISTANT DEAN:

Victor Delgado, M.B.A.

GRAD/INTL ADMISSIONS COORDINATOR:

Priscilla Powers

DIRECTOR OF DEVELOPMENT:

Hart Roussel

Civil & Environmental Engineering

Uksun Kim, *Chair*

Jeff Kuo, *MSEE Program Coordinator*

Computer Engineering

Susamma Barua, *Program Coordinator*

Computer Science

Shawn Wang, *Chair*

Electrical Engineering

Mostafa Shiva, *Chair*

Mechanical Engineering

Roberta Rikl, *Acting Chair*

Software Engineering

Ning Chen, *MSE Program Coordinator*

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