



# engineering news

School of Engineering

SUMMER 14

## SANTA CLARA UNIVERSITY

### DEAN'S MESSAGE

Academic Year 2013–14 was a great one for the School of Engineering at Santa Clara University. Graduate enrollment was up, and we recently graduated the largest undergraduate class in our history. Our position on campus was also strengthened, as engineering accounted for 18 percent of the total undergraduate population—up by 50 percent over the last 6 years—a trend that is expected to continue. In their “2014 Best Colleges” guide, *U.S. News & World Report* ranked our undergraduate program No. 10 among the engineering schools in the country where the highest degree awarded is a bachelor’s or master’s, and seated our graduate program in the Top 100 (No. 97) in the nation in their listing that included all U.S. universities.

Those who know us would not be surprised by these rankings. Santa Clara engineering, with its roots firmly planted in both the traditions of Jesuit education and the innovative culture of Silicon Valley, has long distinguished itself by providing a transformative educational experience for both undergraduate and graduate students.

In this edition of *Engineering News*, you will get just a snapshot of our year, plus a glimpse at our future. For a more in-depth look at the year in review, see my State of the School Address on our website: [scu.edu/engssa14](http://scu.edu/engssa14).

Enjoy!

Godfrey Mungal  
Dean  
School of Engineering

### A Vision for the Future

After nearly a decade of discussion and planning, Santa Clara University has a new integrated strategic plan for enrollment, facilities, and aspirations: *Santa Clara 2020*. Unveiling the plan, SCU President Michael Engh, S.J., noted the University’s desire to “further its societal impact with distinctive, new contributions to the global enterprise of higher education.”

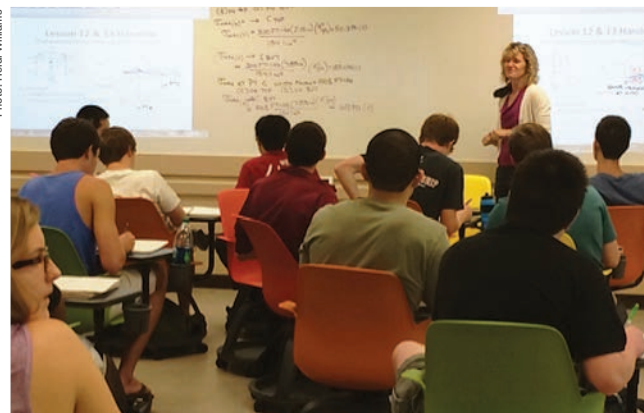
Key to the plan is a focus on STEM education, bringing science, technology, engineering and mathematics facilities, faculty, and students into closer proximity with each other through construction of a new Engineering and Science complex. With engineering outgrowing its facilities while comprising a growing percentage of the total undergraduate population on campus, and in light of the changing pedagogical landscape (technology-enabled learning, flipped classes) enhanced and expanded classrooms, reconfigurable labs, and multidisciplinary collaborative learning spaces are must-haves for the future.

But what types of spaces will best support the STEM disciplines at Santa Clara? To answer that question, Provost Dennis Jacobs announced that an array of representative learning spaces has been identified and a pilot project has been launched to “discover what kinds of learning spaces are most effective in supporting the diverse types of teaching and learning that occur at Santa Clara.” Examples include moveable desks and tables, electronic whiteboards, writeable walls, and more.

Over the next few months, the community will participate in workshops and conversations to determine just what will be needed by 2020 to educate the next generation of ethical entrepreneurial professionals.

We will keep you posted!

Photo: Heidi Williams



A recently refurbished engineering classroom includes some of the features of SCU’s proposed enhanced learning environments—movable chairs and writeable walls.

### All in a Day’s Work for an SCU Engineer

Engineers deal with vast ranges of measurements in the course of their work, such as the extremes of length, height, depth, and force. Here are a few examples of some of the numbers our students and faculty work with:

**Bioengineers** measure molecules at .08nm—some 1 million times smaller than the thickness of a sheet of copier paper.

**The interdisciplinary team** in the Robotics Systems Lab operates a networked satellite control system of 3,000 miles.

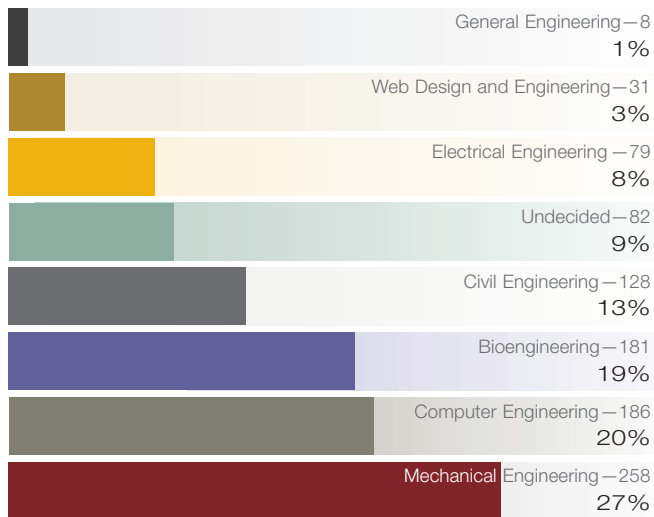
**Mechanical engineers** are developing a deep biosphere instrument to reach a depth of 7,000m below sea level, while others operate a satellite travelling at 640,000m above sea level.

**Electrical engineers** use the probe tip of an atomic force microscope to generate force measuring 1pN, equivalent to 1 millionth of the weight of a grain of salt.

**Civil engineers** apply 445,000 lbs. of force to test the strength of structural components.

**Computer engineers** work on coding video to be transmitted at 10 billion bits per second, and others deal with the more than 1 billion webpages demanding more than 20 terabytes of storage.

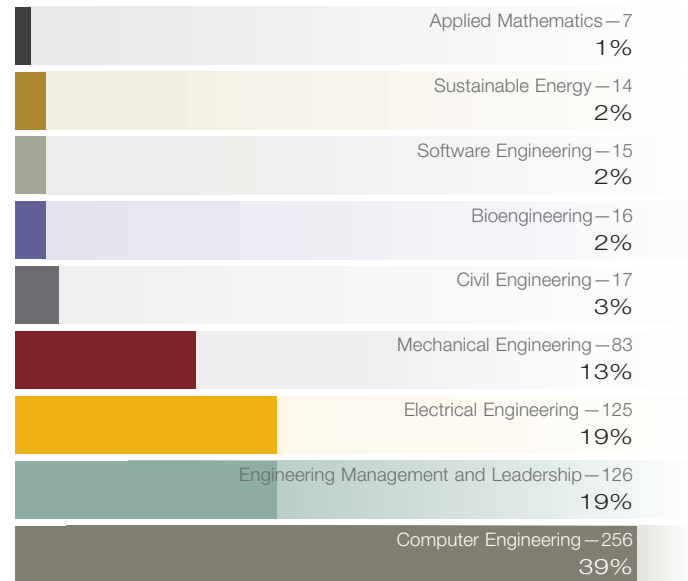
## Undergraduate Enrollment 2014



**Total\*—953, 100%**

\*Female – 218, 23%

## Graduate Enrollment 2014



**Total\*—659, 100%**

\*Excludes certificate and open university; reflects currently enrolled students only

## 2013 Degrees Conferred—594



Bachelor of Science  
273



Engineer's Degree  
2



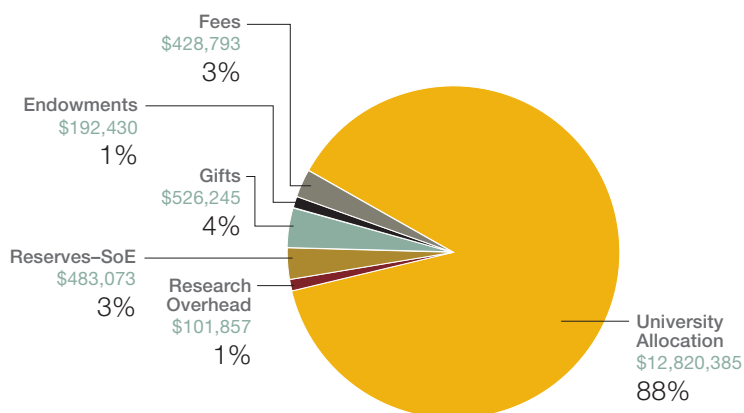
Master of Science  
314



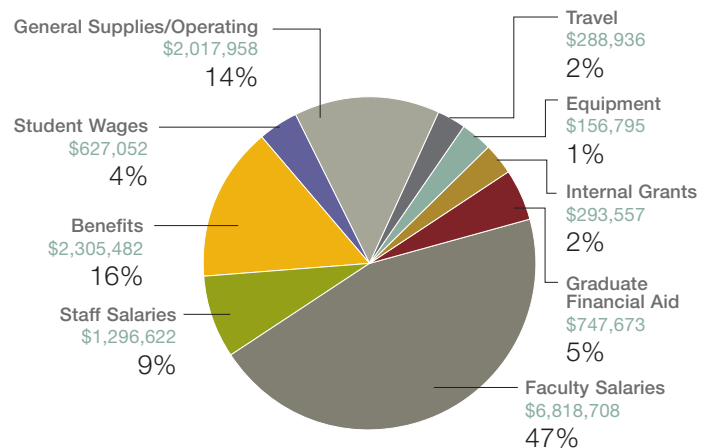
Doctor of Philosophy  
5

## Revenue and Expenses

FY 2013 Revenue Sources—\$14,552,783



FY 2013 Expense Categories—\$14,552,783



# Numbers about us... because we love numbers!

- 1** U.S. patent granted; 8 provisional U.S. patents; 2 China patents filed; 4 international standards adopted—results in 2013–14 from SCU computer engineering’s Video Coding Research Team (SCU faculty, doctoral students, and researchers from Huawei/Hisilicon)
- 2** SCU has the second largest enrollment among the 22 U.S. Catholic engineering colleges
- 5** Distinctive laboratories: Center for Nanostructures, Frugal Innovation Lab, Latimer Energy Laboratory, Maker Lab, Robotics Systems Laboratory
- 6** Bioengineering has had a 6-fold increase in enrollment since the program began in 2009
- 7** New electives offered this year in innovation/entrepreneurship
- 18** Countries visited by faculty for conference presentations
- 24** Students enrolled in the new applied mathematics course, Risk Analysis in Civil Engineering
- 30+** Frugal Innovation projects ongoing in 20+ countries
- 36** Engineering management and leadership courses offered on topics essential to today’s high-performance global organization leaders
- 52** Journal publications by faculty in 2013–14
- 56** Conference papers by faculty in 2013–14
- 87** Senior Design teams—272 students—participated in the 2014 Senior Design Conference
- 408** Enrolled in energy-related courses in 2013–14; up from only 20 in 2005
- 600** Potential Broncos toured the School of Engineering with 893 guests in tow, up more than 40 percent over last year

## Distinctive Labs

The School of Engineering hosts many outstanding labs; here are a few highlights:

**Center for Nanostructures**—a national center of innovation in nanostructures research and education; undergraduate and graduate research, interdisciplinary collaboration with external partners

**Frugal Innovation Lab**—designing accessible, affordable, adaptable, and appropriate solutions for underserved markets; undergraduate design innovation courses; graduate certificate program; collaboration with The Tech Museum of Innovation in San Jose, California

**Latimer Energy Laboratory**—advancing the study of sustainable energy; supporting classes, summer research, capstone projects; educating the energy leaders of tomorrow through the self-guided Latimer Energy Scholars program

**Maker Lab**—easy access, hands-on prototyping for everyone; supporting courses, capstone teams, personal projects; 150+ students certified; Maker Club; quarterly Maker Challenges spur innovation and entrepreneurship; projects run the gamut from personalized iPhone covers to a dashboard for an autonomous vehicle

**Robotics Systems Laboratory**—a world-class field robotics program for air, land, sea, and space; running mission operations for three NASA satellites; underwater robot and autonomous mapping missions in Lake Tahoe led to student and faculty journal article submissions; leading a new multi-university consortium on aerial drones (UAVs)

## Ph.D. Students by Department

2013–2014

(45 Total reflects currently enrolled students only)

- 6** Mechanical Engineering 
- 16** Electrical Engineering 
- 23** Computer Engineering 



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 500 El Camino Real  
 Santa Clara, CA 95053

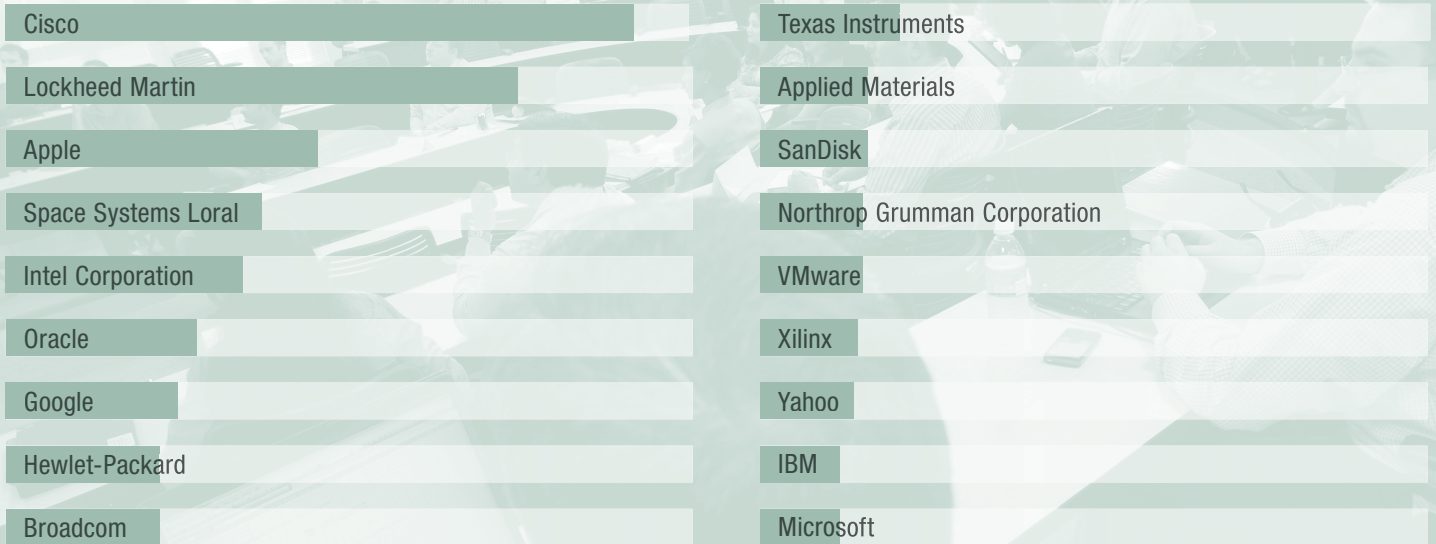
Nonprofit  
 Organization  
 US Postal  
 PAID  
 Permit No. 22  
 Santa Clara, CA

The Jesuit University in Silicon Valley



## Where They Work

Top employers of SCU engineering graduates 2003–14



Source: LinkedIn