



SANTA CLARA UNIVERSITY

STATE OF THE SCHOOL OF ENGINEERING 2018

Alfonso (AI) Ortega
Sobrato Professor of Engineering
Dean, School of Engineering

March 10, 2018

Alfonso (AI) Ortega Sobrato Professor and Dean

- **PhD, MS Stanford, Mechanical Engineering**
- **BS Texas-El Paso, Mechanical Engineering**
- **2005-2017 Villanova University**
 - ✓ Associate VP Research & Graduate Programs
 - ✓ Associate Dean Graduate Programs
 - ✓ Director, NSF Center for Energy Smart Electronic Systems
- **2004-2006 National Science Foundation, Program Director**
- **1988-2004 University of Arizona, Mechanical Engineering**



New Staff



David Clark
Senior Assistant Dean

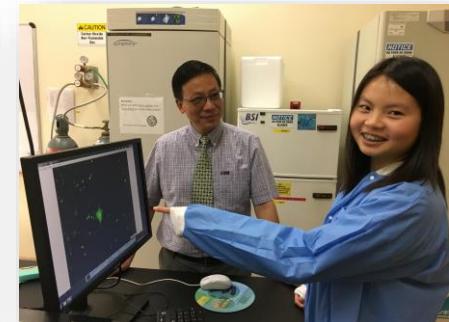


Mary Coady
Director, Corporate and External Relations

Bronco Engineering: Our Mission

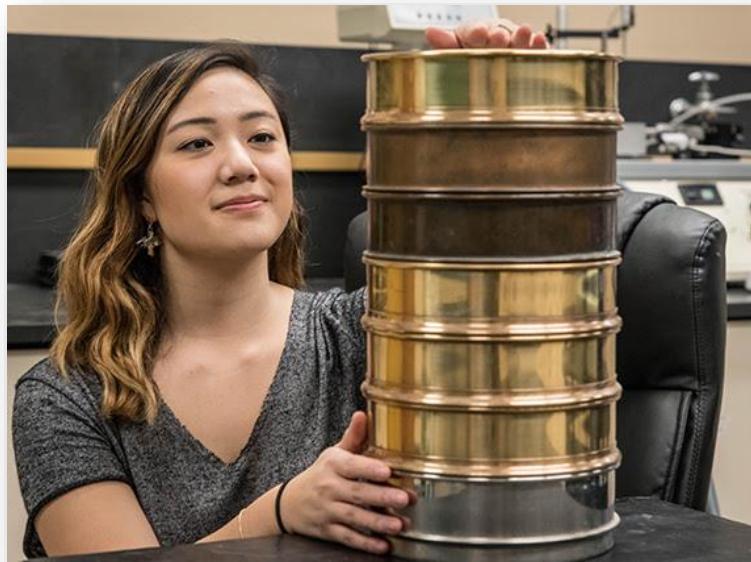
Prepare diverse students for professional excellence, responsible citizenship, and service to society through:

- distinctive academic programs
- broadly educated faculty
- scholarly activities that create new knowledge and advance the state of the art of technology
- interactions with professional societies and companies in Silicon Valley and beyond
- service activities that benefit diverse constituencies



Bronco Engineering: Our Vision

- Educate the whole person to solve society's most complex problems
- Educate entrepreneurial thinkers who will build a more just, humane, and sustainable world



Audrey Gozali '18 (civil engineering)
clean drinking water



Sam Bertram '16, MS '18 mechanical engineering
sustainable indoor farming

We are the Jesuit University in Silicon Valley

My emerging thoughts on that vision

We will be **THE** destination for highly motivated and talented students who aspire to become Engineering Leaders and Innovators of Conscience, Competence, and Compassion

Our Excellence will be recognized by

- = Being HIGHLY known and respected in Silicon Valley for **NOT** being Stanford and UC-Berkeley
- = Being regarded as one of the **TOP FOUR** Catholic Engineering programs in the country (arguably with Notre Dame University, University of Dayton, Villanova University)

Spring 2022 Sobrato Campus for Discovery and Innovation





SANTA CLARA UNIVERSITY

2020 Capital Projects



- Sobrato Campus for Discovery and Innovation
- Benson Center renovation/expansion
- Finn Residence Hall



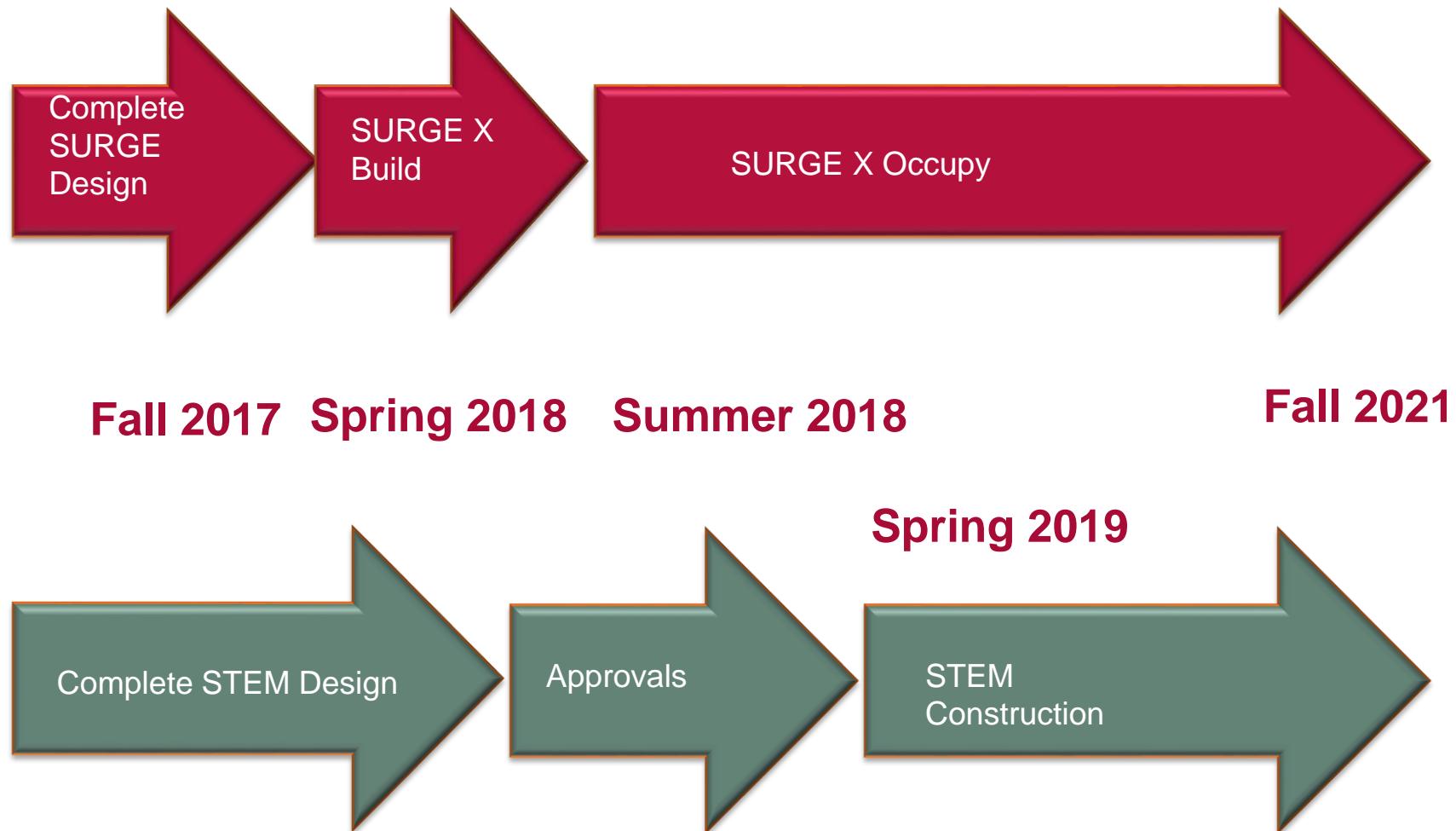
Legend:

Buildings

Alameda Axis



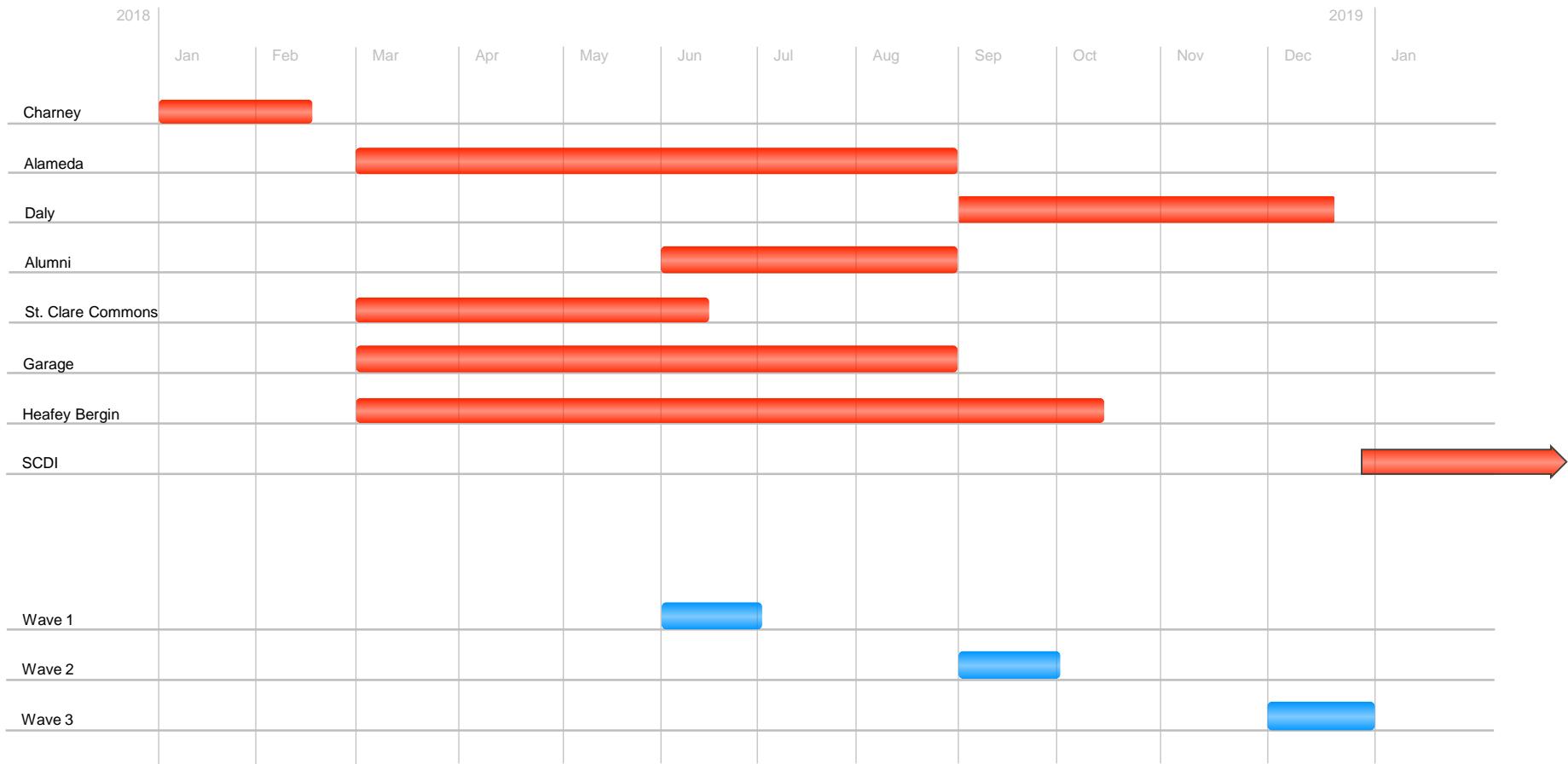
Path to Sobrato Campus for Discovery and Innovation





SANTA CLARA UNIVERSITY

Santa Clara University | STEM Timelines





Heafey





SURGE: Fall 2018-Fall 2021



Renderings of interior of Alameda Hall (Civil Engineering) and Heafey

The Sobrato Campus for Discovery and Innovation INNOVATION ZONE



SOE HORIZONTALS: WHO DO WE SERVE?

BS Engineers

- Professional engineering path
- Future engineering management/law/medicine

BS Entrepreneurs

- Future entrepreneurs
- Engineering/Business/I&E

BS Researchers

- Graduate School bound
- Interested in working in R&D

MS Professional

- Mostly part-time working students
- Goal is to work in Silicon Valley

Doctoral Researchers

- Mostly part-time working students
- Desire to achieve doctoral status

SOE VERTICALS: WHAT DO WE DO?

CURRICULA / CO-CURRICULA

DISCOVERY RESEARCH

INNOVATION AND ENTREPRENEURSHIP

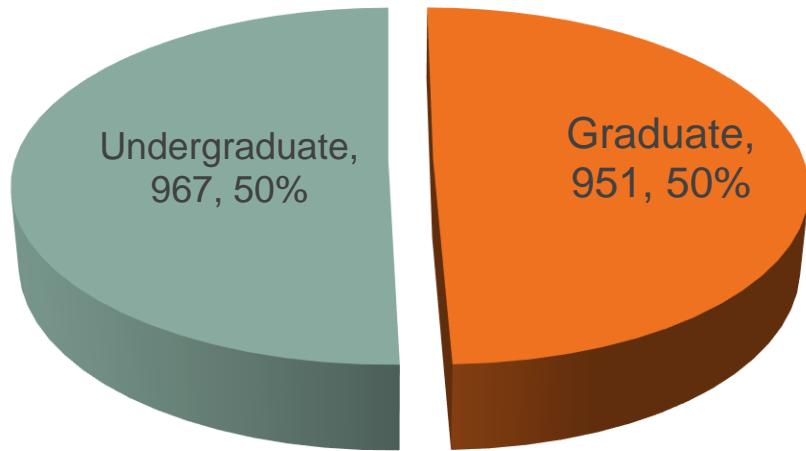
HUMANITARIAN ENGINEERING SERVICE

Our Undergraduates

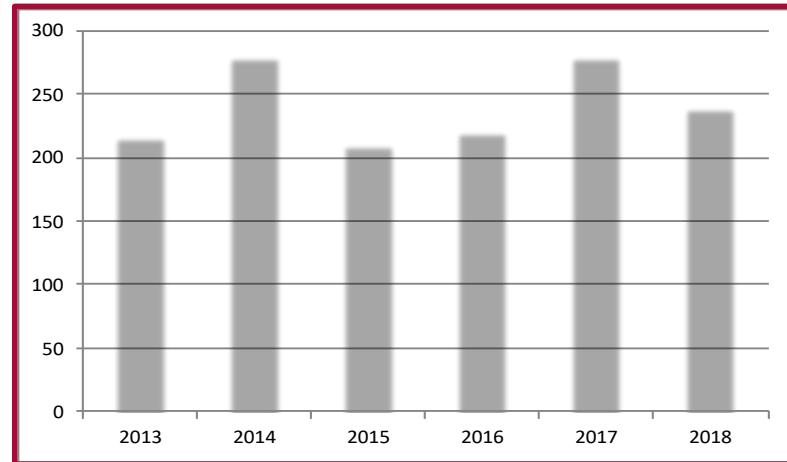


UNDERGRADUATE ENROLLMENT 2017-18

967 undergraduate students (280 female 29%) ◊ 951 graduate students



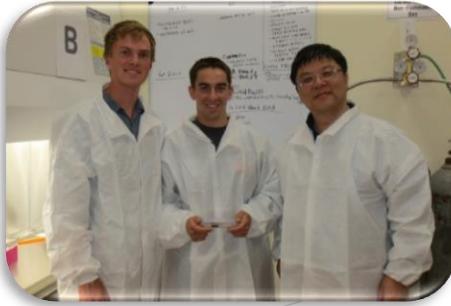
First Year Enrollment



2017-2018 Undergraduate Enrollment



Web Design and Engineering

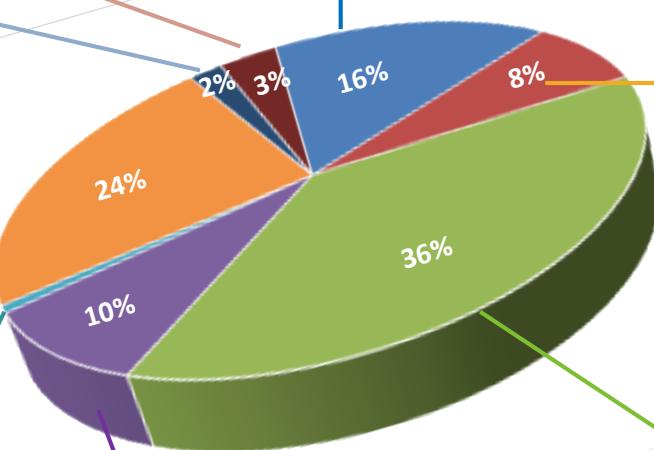


Bioengineering



Mechanical Engineering

Undeclared



General
Engineering
1%

Electrical Engineering

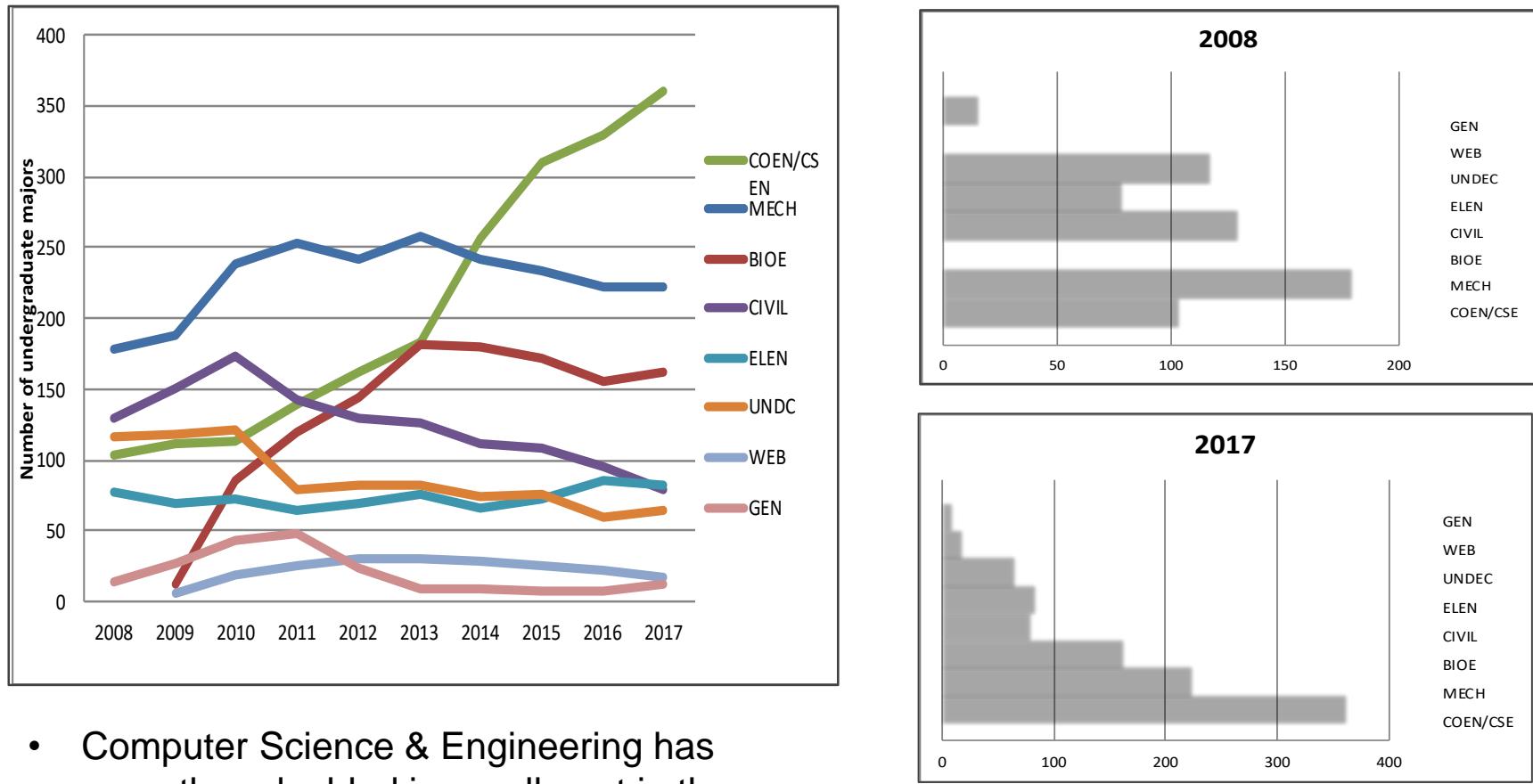


Civil Engineering



Computer Science
and Engineering

Undergraduate Majors Enrollment 2008-17



- Computer Science & Engineering has more than doubled in enrollment in the past 5 years
- Consistent with national trends

We are Committed to Diversity and Inclusion

We strive to recruit, retain and support a diverse community of students, faculty and staff to foster an environment that:

- Fuels intellectual growth
- Stimulates creative and critical thinking
- Nurtures empathy and respect
- Enhances growth
- Prepares students for future personal and professional success

SCU NSBE organization was named their region's Best Small Chapter!



- **Newly created Council on Diversity and Inclusion**
- **New position for Director of Diversity and Inclusion in the works**

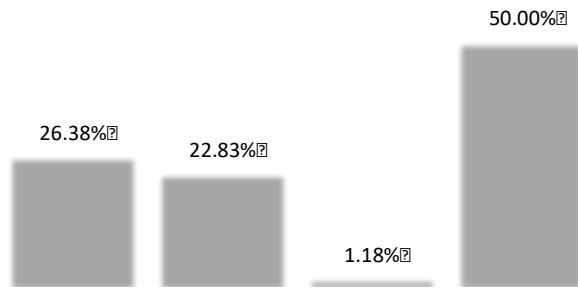
Pavithra Nagarajan '20
(bioengineering) received a
SCU Diversity Works Award

Engineering Committee on Diversity and Inclusion - Required faculty search committee training - Teaching practices workshops - Bias busting workshops - Outreach and residential programs for high school students - NSBE and SWE recruitment calling campaigns – Preview Day travel grants for underrepresented students - Women in Engineering events – Mentoring - Funding for NSBE, SHPE, SWE, GHC conference attendance - SCU Office of Multicultural Learning

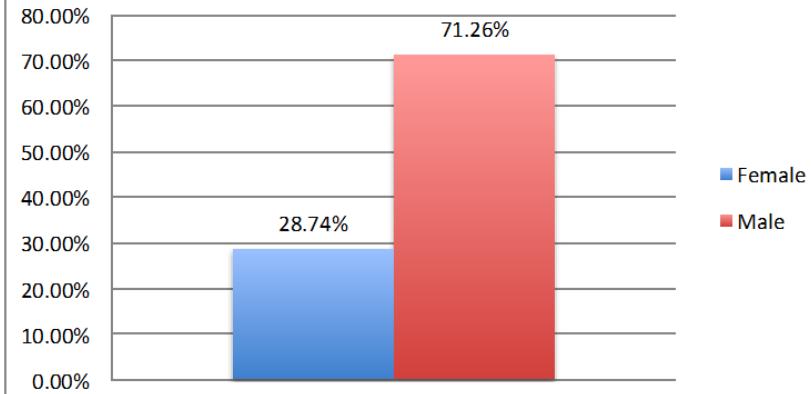
Undergraduate Student Diversity: Fall 2017

First Year Students 2017 Ethnicity

Asian □ URM □ not specified □ white □



254 First Year students - fall 2017



- = 23% of our students are from underrepresented groups
- = 29% of our students are Female

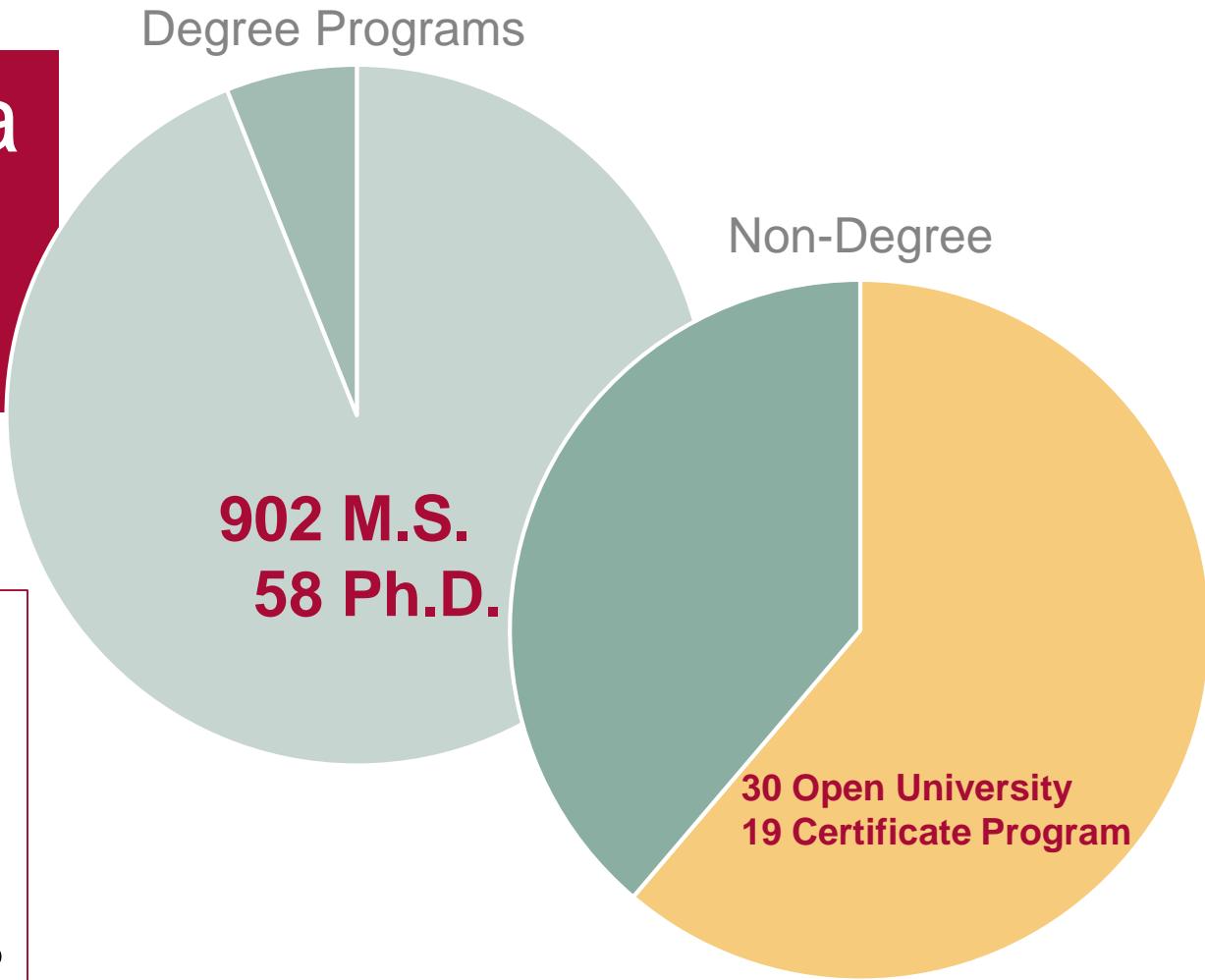
Our Graduate Programs



Graduate Programs Enrollment

**26% F-1 Visa
International
Students**

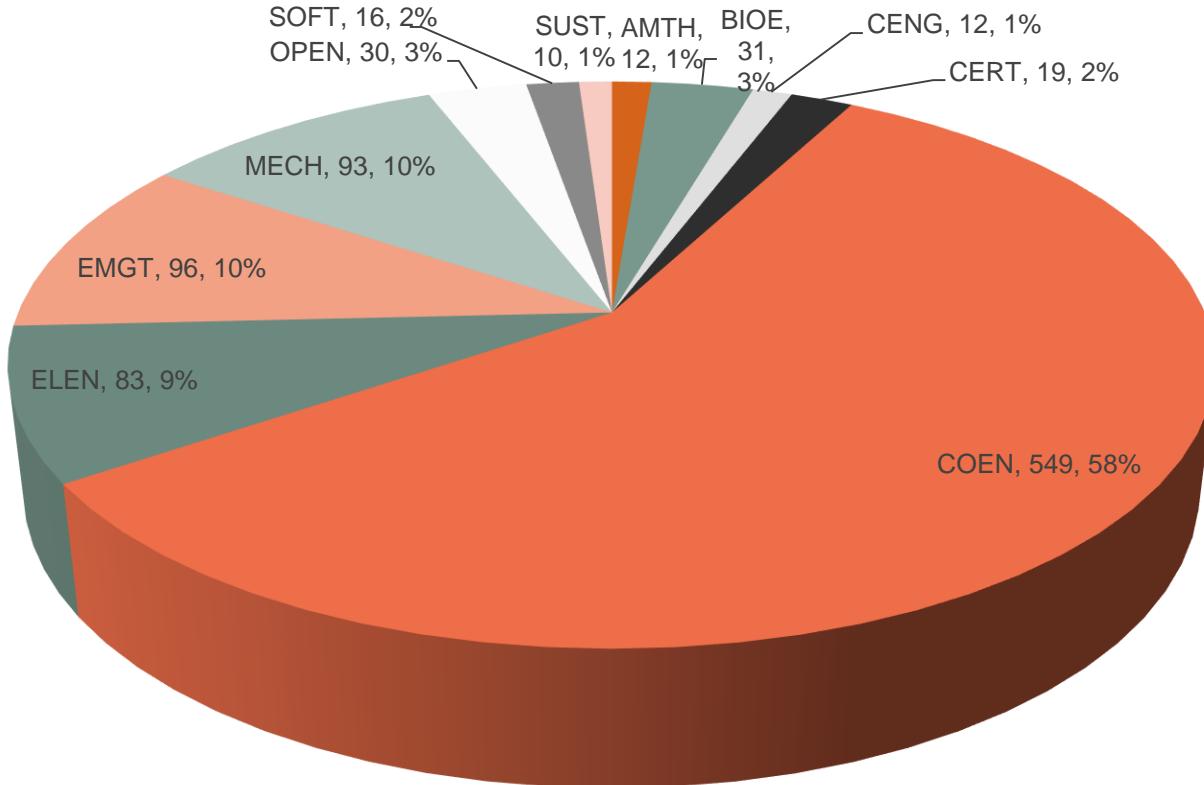
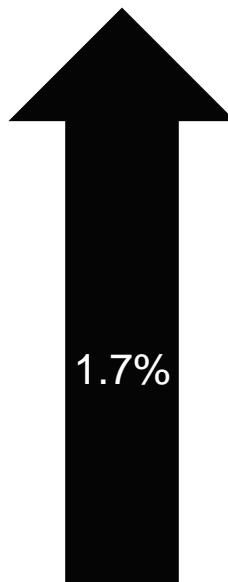
Female Enrollment:	
M.S. Program	40%
Ph.D. Program	21%
Open University	17%
Certificate Program	26%



Graduate Departments and Degrees – M.S.

951 MS Graduate Students

M.S. Student Summary FY 2017-2018
(951 Total - Reflects currently enrolled students only)



Innovative Graduate Curricula

- **Graduate Core** – deepen understanding of engineering's interdisciplinary environment
 - Emerging Topics in Engineering
 - Engineering and Business/Entrepreneurship
 - Engineering and Society
- **Minor: Science, Technology, and Society**
 - Engineering's influence on society
 - Ethics, social responsibility
- **Courses**
 - Building Global Teams
 - Engineering for the Developing World
 - Gender and Engineering
 - Innovation, Design, and Spirituality

Our graduate professional courses are often taught by industry experts in their fields



SOE VERTICALS

BS Engineers

BS Entrepreneurs

BS Researchers

MS Professional

Doctoral
Researchers

CURRICULA / CO-CURRICULA

DISCOVERY RESEARCH

INNOVATION AND ENTREPRENEURSHIP

HUMANITARIAN ENGINEERING SERVICE

**Hands-on Learning is the
Essence of our Curricula**

*Let us celebrate our creative
Broncos!*

ENGR 110: Community-Based Student Projects



Jes Kuczenski

- 15 projects completed in a single quarter – fall through spring
- Developing solutions to real problems for actual clients
 - Automatic Bee Door
 - Biogas Digester
 - Energy Bike ReDesign
 - Rain Catchment System
 - Rain Storage Upgrade
 - Shade Structure
 - Solar-Powered Live Stream Camera
 - Stadiometer
 - Weather Station

- Clients

- SCU Forge Garden
- Gardner Academy
- Kendal's Bees
- SCU Center for Sustainability
- SCU Kids on Campus
- Pediatric Wellness Group
- Rocketship Mosaic Elementary



Contests, Competitions, and More

Sacramento Municipal Utilities District's 2018 California Solar Regatta

An annual state-wide engineering competition to design, build, and race a solar-powered boat



Hack for Humanity



Quarterly Innovation Challenge

Senior Design Projects

Just a few of the Spring 2018 Projects

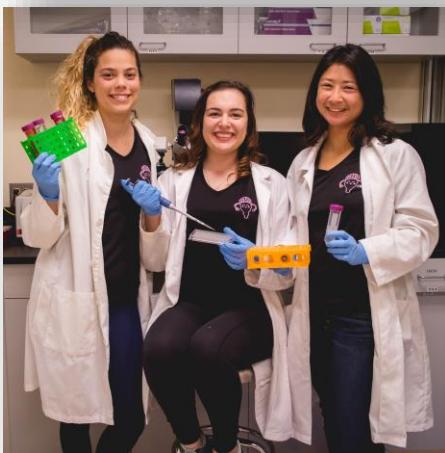
Soft Robotic Hand



Powering a Biosensor Using Wearable Thermoelectric Technology



Rainwater Capture and Purification System for Rural Tanzania



Data Visualization in Virtual Reality

Cervical Cancer Early Response Visual Identification System



Redesign of I-680/SR-262 Interchange in Fremont

Sherlock: A Virtual Crime Scene Reconstructor

Energy Conservation of Buildings Using IoT Devices

Cryptocurrency Hardware Wallet

Climate Smart Farming for East Africa

Wireless Multi-user Communication System

Maker Lab



Anne Mahacek

Chris Kitts

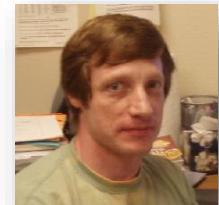
Easy-access, hands-on prototyping for the SCU community

- 1500+ sq ft facility in Guadalupe Hall:
 - 3D Printers, Laser Cutters, CNC Routers and Mills
 - Circuit Board Fabrication Machines
 - Traditional hand and power tools
- 1250+ students/staff/faculty certified
- Supports a range of university activities
 - 12+ courses a year & dozens of capstone projects
 - Extracurricular design/fab innovation challenges
 - Personal projects
- Community engagement:
 - Industry partners, K-12 outreach, adult education



Engineering Computing Center

Supporting graduate and undergraduate student learning and faculty research



Lantz Johnson

- 12 labs
- ~300 high-end computers
- ~300 engineering applications
- 3 operating system platforms: Linux, Windows, Mac
- 30+ virtual servers for infrastructure support
- Computing services: Oracle database, Apache Web servers, file sharing, big data, remote access, data backups
- Computers replaced every 3 years; constantly adding new services and technologies

Upcoming:

- Increased data storage capacity
- Significantly increased data access speed utilizing solid state drives



STRATEGIC PRIORITY

Disciplinary
(STEM)
Convergence

- Discovery is at the intersection of engineering and science

Curriculum & Research Directions & Opportunities

- Sustainable Environment, Energy, Infrastructure
- Cyber-Physical Systems/ IOT/Robotics
- AI / Data Analytics /Machine Learning/Data Visualization
- BioHealth, Biomedical Devices

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BS Engineers

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Doctoral
Researchers

CURRICULA / CO-CURRICULA

DISCOVERY RESEARCH

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Faculty Research

A sampling:

- Data security
- Devices for biomedical applications
- Energy conversion systems
- Machine learning
- Nanotechnology
- New generation of materials
- Robotic design and control
- Sustainable building materials
- Tissue and protein engineering

...and more!



Ahmed Amer- Computer Engineering

Data and its storage, including predictive management, and addressing questions surrounding the trustworthiness, resilience, and ethics of data and systems



Panthea Sepehrband - Mechanical Engineering

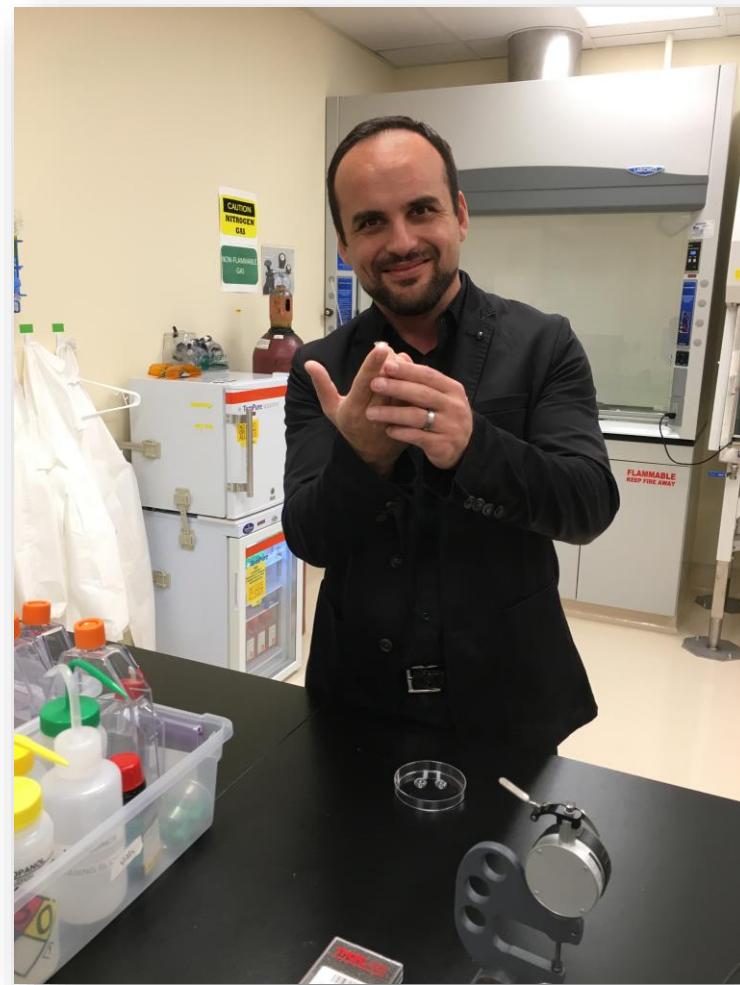
Development of new generation of materials with specific properties through a synergy of multi-scale computational modeling and experimental analysis

\$330,000 NSF Funding

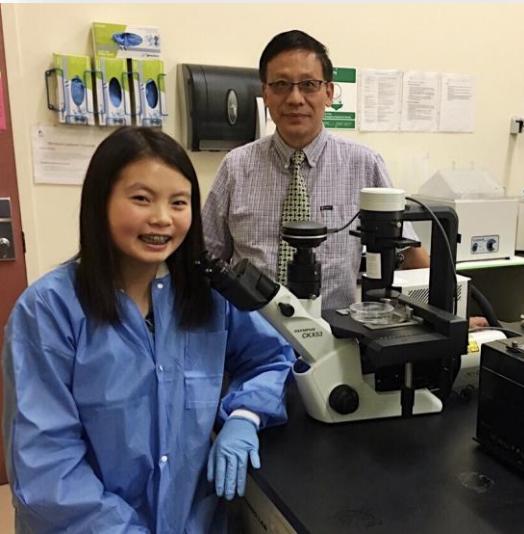


Emre Araci - Bioengineering

Development and application of implantable and miniaturized micro/optofluidic technologies for biology and medicine



Student Research



Kuehler Research Grant:

- Paid undergraduate summer research
- One-on-one collaboration with faculty supervisor
- Opportunities for student work to be published

Interdisciplinary :

BioInnovation & Design Lab
Frugal Innovation Hub
Latimer Energy Lab
Robotics Systems Lab



Presentations at national conferences

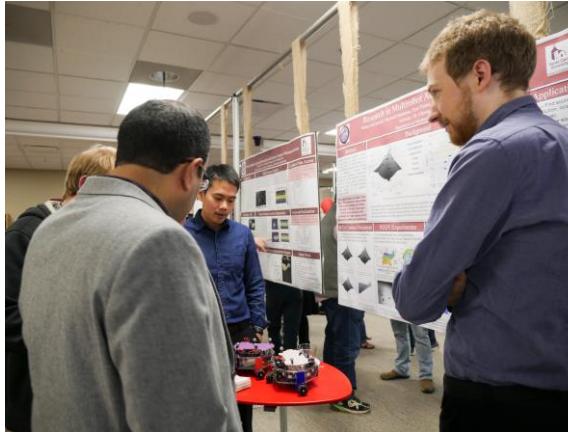
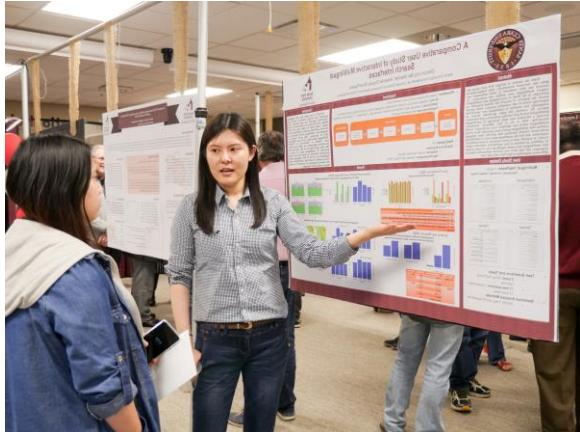


Pilot program for City of San José: flood warning system

Engineering Research Showcase

February 23, 2018

- featured part of e-Week
- 33 posters presented by faculty, post-docs, PhD candidates, master's, undergrad students
- bioengineering, computer science and engineering, electrical engineering, mechanical engineering
- ~400 attendees!



Research Highlights 2018

- External research sponsors: NSF, NASA, ONR , Cypress Semiconductor, Genentech, Huawei Technologies, others
- Hosted on-campus symposia: 46th Annual Electronic Materials Symposium, Disaster Relief Workshop, Cyber Intelligence Symposium
- New initiative to evaluate, restructure, and unify the doctoral programs across the School of Engineering
- New initiative on IP commercialization and marketing, with several SoE technologies going through this process
- ~25% of tenure-stream faculty are Fellows of their respective societies;
- ~25% are editors, associate editors, board members of major research journals

Research Laboratories

Robotics Systems Laboratory

A world-class field robotics program for land, sea, air, and space



Chris Kitts

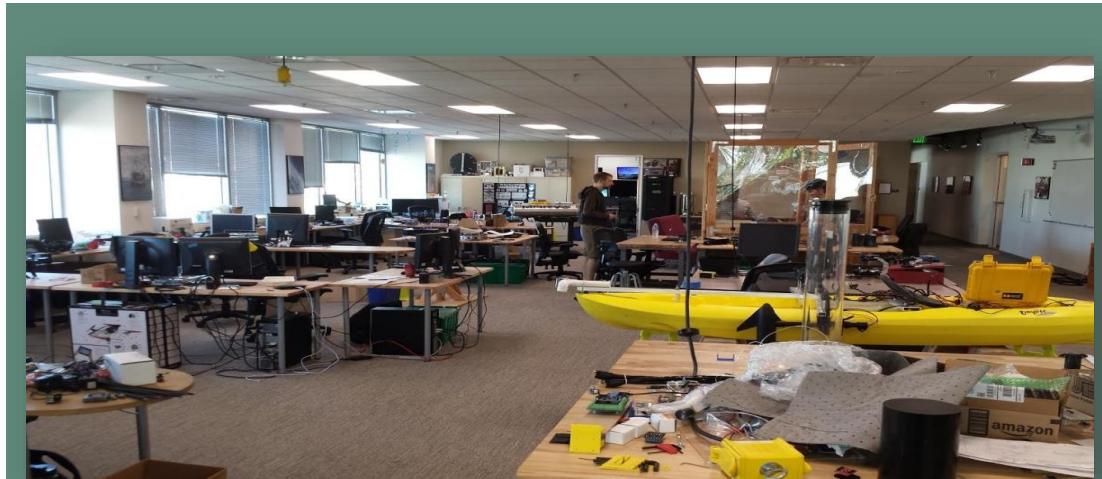
Mission Success!



SCU students served as the mission control team for the NASA EcAMSat spacecraft mission, launched in November 2017.



After a 2 years hiatus due to new FAA regulations, drone flights have resumed for education and research projects.



RSL's main lab space on the 3rd floor of Guadalupe Hall. More than 80 students currently work in the lab on design projects or research work.

RSL has received more than \$7 Million in project/research funding over the past decade. New projects and initiatives include:

Mobile Sensor Networks for Environmental Monitoring

Prosthetic Hand Development

Development of a Small Environmental Monitoring Satellite

Development of a Hybrid Aerial/Underwater Robot:

Collaborators Include: NASA, US Geological Survey, Monterey Bay Aquarium Research Institute, Jaipur Foot Organization, CA Space Grant

Latimer Energy Laboratory



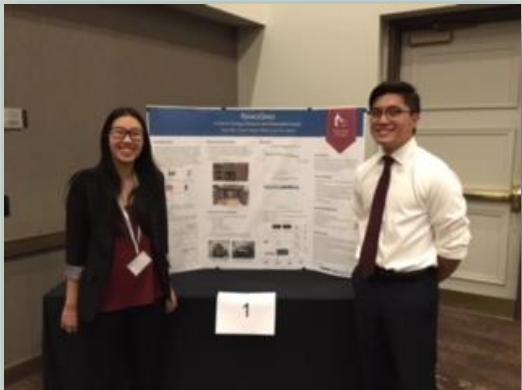
Maryam Khanbaghi

Summer Project 2017: NanoGrid



Tour of Silicon Valley Power Plant, Winter 2018

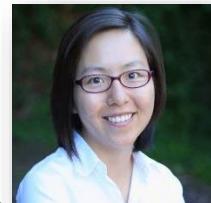
Poster
Presented:
**IEEE
SusTech**
Nov. 2017



Ongoing 2018-19 Projects:

- NanoGrid Control (**ELEN - Khanbaghi**)
- Technology Taxonomy of the IoT-based Net-Zero Energy Smart Buildings (**CENG - Said**)
- Towards Enabling Machine Learning on Solar-Powered IoT Edge Devices (**COEN - Dezfouli**)

Center for Nanostructures



Ashley Kim

87

of students, faculty, and collaborators who currently access the CNS facility

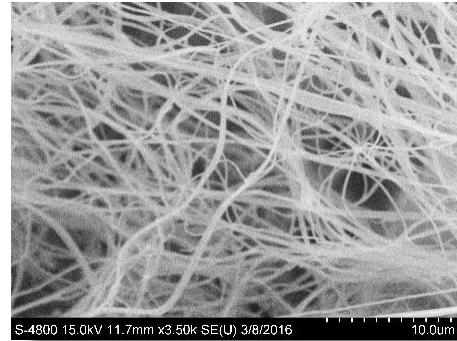
6

of departments (3 SoE and 3 A&S) with research and teaching in CNS utilizing:

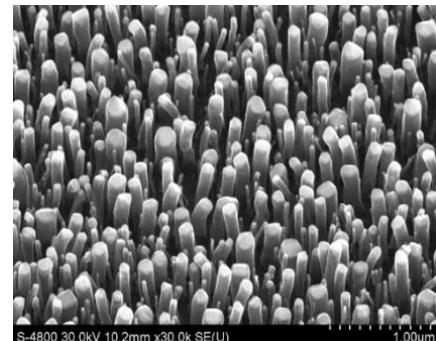
- a Scanning Electron Microscope
- an Atomic Force Microscope
- a Cascade Probe Station
- a lithography/processing lab



microfluidic devices



insect (embiid) silk



carbon nanostructures

Recent focus on **Silicon Valley** partner collaborations which have led to student internships/placements/publication



Stephenson & Associates, Inc.



SOE VERTICALS

BS Engineers

BS Entrepreneurs

BS Researchers

MS Professional

Doctoral
Researchers

CURRICULA / CO-CURRICULA

DISCOVERY RESEARCH

INNOVATION AND
ENTREPRENEURSHIP

HUMANITARIAN
ENGINEERING SERVICE

STRATEGIC PRIORITY

Innovation & Entrepreneurial Thinking

- Companies survive and thrive by being Innovative and Entrepreneurial
- We must educate modern engineers to be innovative & entrepreneurial

Directions & Opportunities

- **Curricula in Innovation, Human Centered Design Thinking, Entrepreneurship**
- **Co-Curricular opportunities from early first year encounters to pathways to start-ups**
- **Deep integration with Business, Law, Humanities**

Fostering an *Entrepreneurial Mindset*

pathway, courses, contests, mentoring, networking



Quarterly Competitions:

Fall - \$1,500 Grand Prize: San Jose Earthquakes. Improve the fan experience

Winter - \$2,500 Grand Prize: Nike. Propose a Nike shoe concept in which the shoes are linked by the Internet of Things

Spring - \$10,000 Grand Prize: THRIVE AgTech. Propose a solution to the seasonal agriculture labor shortage

The Design Thinking Core Curriculum Pathway

- the most popular pathway among engineers

New Minor in Technical Innovation

- designed to fit within the engineering schedule
- includes special track for BioInnovation & Design

5-class “Starting a Business” Workshop

12+ courses this year, including several new offerings:

- ENGR 140 – Diversity & Innovation in STEM (4 units)
- ENGR 166 – Introduction to Design Thinking (1 unit)
- ENGR 165 – Creativity: The Art of Innovation (1 unit)

We are a leading institution in KEEN, a 30+ university network focused on improving education in innovation and the entrepreneurial mindset.



**4-year, \$1.4 Million
Grant from the Kern
Family Foundation**

BioInnovation and Design Laboratory



Prashanth Asuri

Partnering with industry to create new biomedical solutions that transform domestic and global health

- \$180,000 gift from Vernon and Annie Norviel in support of interdisciplinary student projects
- Five external project partners and total funding of \$70,000 in the first year
- Example projects in the Industry track:
 - Wearable sensors, AI/ML tools for disease diagnosis
- Example projects in the Humanitarian track:
 - Affordable myoelectric prostheses, Frugal skin graft mesher

Internal partners

Frugal Innovation Hub
SANTA CLARA UNIVERSITY
SCHOOL OF ENGINEERING



 **Miller Center**
for Social Entrepreneurship

Corporate partners

proteus®
DIGITAL HEALTH

VARIAN
medical systems

 **Cepheid®**

 **JAIPURFOOT**

 **pediatric
wellness
group**

PRIORITY: SCU Community for Innovation and Entrepreneurship

Vision

The CIE will serve as the administrative home for an affiliation of institutionalized programs intended to support, promote, and fund innovation and entrepreneurship as an intellectual, co-curricular component of an SCU undergraduate education for students from all academic units

ALL SCU students will be exposed to I&E; through early introductory encounters to in-depth Accelerator programs for budding entrepreneurs

SCU will be the Leader in
Student Innovation and Entrepreneurship

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BS Engineers

BS Entrepreneurs

BS Researchers

MS Professional

Doctoral
Researchers

CURRICULA / CO-CURRICULA

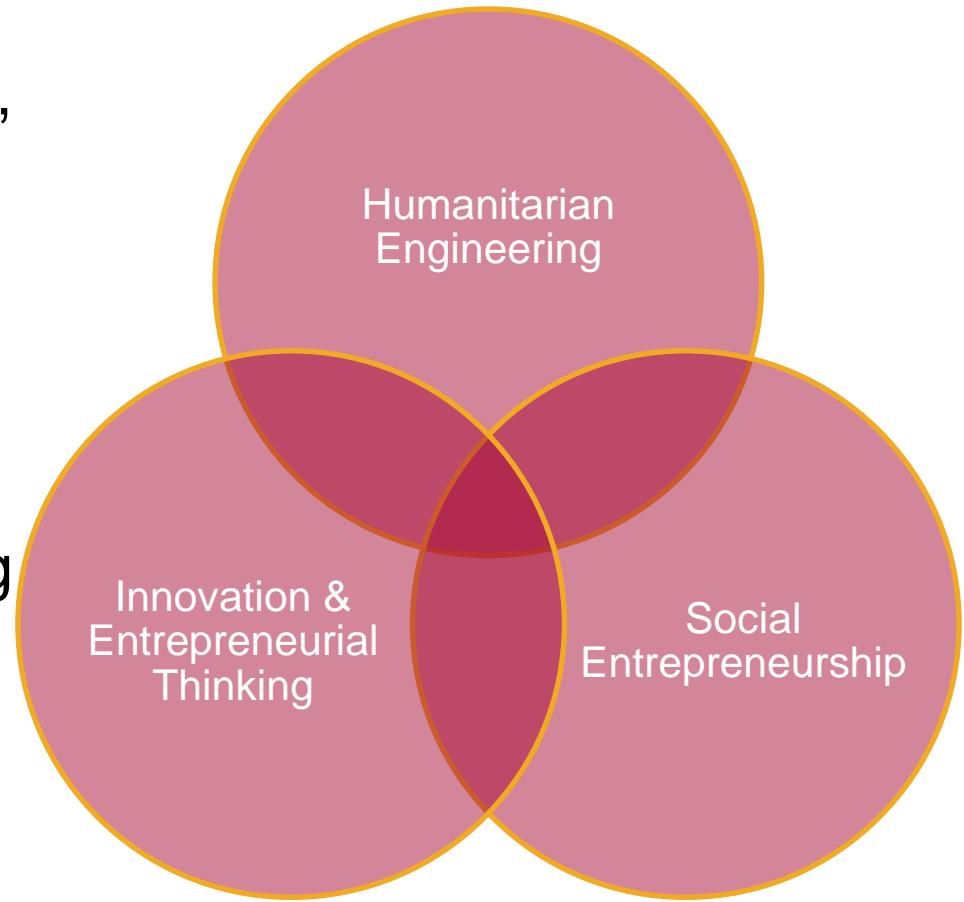
DISCOVERY RESEARCH

INNOVATION AND ENTREPRENEURSHIP

HUMANITARIAN ENGINEERING SERVICE

Humanitarian Engineering at SCU

- Using Engineering skills, techniques, and processes in service to humanity
- Making use of skills learned in Innovation & Entrepreneurial Thinking classes and activities
- Partnering with Miller Center, Leavey School Global Fellows, Ignatian Center





Allan Baéz

Frugal Innovation Hub

Engaging students and faculty in technological and humanitarian projects through partnerships and programs



Silvia Figueira

- **New Director of Programs and Partnerships:** Allan Baéz
- **14 Humanitarian Senior Projects**
- **8 Humanitarian Graduate Projects for 7 Clients:** Flood Detection, City of San José
- **6 Conference Papers:** IEEE Global Humanitarian Technology Conference
- **14 New Partnerships:** Jaipur Foot, City of San José, The Butui Project, IncidentAid,
- **4 Jesuit Universities:** Building relationships with Latin American partners to incorporate a Frugal approach to their projects
- **3 Trips, 9 Students:** Nicaragua, Tanzania, Uganda
- **60+ Visitors:** KU Leuven University Committee; SES Networks VP of Global Government Sales; Founder and President of World Health Partners; City of San José Chief Innovation Officer; Head of Global Engagement One Concern

Project Focus:

Good Health and Well Being

Quality Education

Empowerment and Economic Growth

Sustainable Cities and Communities



Engineers Without Borders



Tonya Nilsson

- ~30 members with roles in engineering, education, PR/fundraising and overall club leadership
- Developing solutions to real-life problems
- Multi-year project in Nyange, Rwanda
- Women's tile-making cooperative
- Working with Pico International
- Clay Tile Press
- Clay Mixer
- Future: clay transport solution, solar



International Collaborations



Alex Zecevic

- Catholic University of Uruguay (Montevideo)
- Catholic University of Cordoba (Argentina)
- St. Xavier's College, Kolkata
- St. Xavier's College, Mumbai
- IIT Delhi
- Shanghai Jiao Tong University
- Wuhan University of Technology
- Lanzhou University
- Technical University of Hamburg/Harburg (TUHH)

Student/Faculty Exchange...Faculty Research...Immersion...Student Projects

Academic Departments

Applied
Mathematics

Bioengineering

Civil
Engineering

Computer
Engineering

Electrical
Engineering

Engineering Mgmt.
& Leadership

Mechanical
Engineering

Sustainable
Energy



Stephen Chiappari

Applied Mathematics

Serving School of Engineering Students and Faculty

- Undergrad and grad courses
- Collaborative research
- Consultation, expertise, and assistance
- Master's degree program
- Mathematical Finance concentration
within M.S. degree

For if $A_{ij} = \frac{\partial f}{\partial x_i}$, and if $P = a_1x_1 + a_2x_2 + \dots + a_nx_n$
and B, G , and M are independent variables, then
 $\frac{\partial P}{\partial x_i} = a_i$ and
 $\frac{\partial P}{\partial B} = \frac{\partial P}{\partial x_1} \cdot \frac{\partial x_1}{\partial B} + \frac{\partial P}{\partial x_2} \cdot \frac{\partial x_2}{\partial B} + \dots + \frac{\partial P}{\partial x_n} \cdot \frac{\partial x_n}{\partial B}$
Integrating, we get
 $P = \int \frac{\partial P}{\partial B} dB = \int \frac{\partial P}{\partial x_1} \cdot \frac{\partial x_1}{\partial B} dB + \int \frac{\partial P}{\partial x_2} \cdot \frac{\partial x_2}{\partial B} dB + \dots + \int \frac{\partial P}{\partial x_n} \cdot \frac{\partial x_n}{\partial B} dB.$
If the a_i 's are constant coefficients, then the rates,
 $\frac{\partial}{\partial x_i}$'s, are constant also and can be taken outside
of the integrals. Therefore,
 $P = \frac{\partial P}{\partial x_1} \cdot \int dB + \frac{\partial P}{\partial x_2} \int dB + \dots + \frac{\partial P}{\partial x_n} \cdot \int dB$ or
$$P = \frac{\partial P}{\partial x_1} B + \frac{\partial P}{\partial x_2} B + \dots + \frac{\partial P}{\partial x_n} B + K.$$

Furthermore,
$$\begin{aligned}A_1 &= \frac{\partial f}{\partial x_1} B = \frac{\partial f}{\partial x_1} B + \frac{\partial f}{\partial x_2} B + \dots + \frac{\partial f}{\partial x_n} B \\A_2 &= \frac{\partial f}{\partial x_2} B = \frac{\partial f}{\partial x_1} B + \frac{\partial f}{\partial x_2} B + \dots + \frac{\partial f}{\partial x_n} B \\A_3 &= \frac{\partial f}{\partial x_3} B = \frac{\partial f}{\partial x_1} B + \frac{\partial f}{\partial x_2} B + \dots + \frac{\partial f}{\partial x_n} B \\&\vdots \\A_n &= \frac{\partial f}{\partial x_n} B = \frac{\partial f}{\partial x_1} B + \frac{\partial f}{\partial x_2} B + \dots + \frac{\partial f}{\partial x_n} B\end{aligned}$$

$$\begin{aligned}&\text{where: } \left| -2x^4y^3 - 2x^3y^2 - 2x^2 \right| \left(\operatorname{Arctan}\left(\frac{\sqrt{x^2-y^2}}{\sqrt{x+y}}\right) \sqrt{x+y} \sqrt{\frac{x^2-y^2}{x+y}} \sqrt{\frac{(x+y)^2}{(x-y)^2}(x+y)} + x^2y^2 - x^4 \right) + \\&\quad \sqrt{(x+y)^2(x+y)} \left[\left(-2x^4y^3 - 2x^3y^2 - 2x^2 \right) \operatorname{Arctan}\left(\frac{\sqrt{x^2-y^2}}{\sqrt{x+y}}\right) \sqrt{x+y} \sqrt{\frac{x^2-y^2}{x+y}} \sqrt{\frac{(x+y)^2}{(x-y)^2}(x+y)} + \right. \\&\quad \left. \sqrt{(x+y)^2(x+y)} \left(-2x^4y^3 - 2x^3y^2 - 2x^2 \right) \operatorname{Arctan}\left(\frac{\sqrt{x^2-y^2}}{\sqrt{x+y}}\right) \sqrt{x+y} \sqrt{\frac{x^2-y^2}{x+y}} \sqrt{\frac{(x+y)^2}{(x-y)^2}(x+y)} \right] + \\&\quad 2 \operatorname{Arctan}\left(\frac{\sqrt{x^2-y^2}}{\sqrt{x+y}}\right) \sqrt{x+y} \sqrt{\frac{x^2-y^2}{x+y}} \sqrt{\frac{(x+y)^2}{(x-y)^2}(x+y)} + \\&\quad 2x^3 \left(\operatorname{Arctan}\left(\frac{\sqrt{x^2-y^2}}{\sqrt{x+y}}\right) \sqrt{x+y} \sqrt{\frac{x^2-y^2}{x+y}} \sqrt{\frac{(x+y)^2}{(x-y)^2}(x+y)} + (x+y)^2(x+y)^2 \right)\Bigg| \\&\quad \left[(x+y)^2 \sqrt{(x+y)^2(x+y)} \right]\end{aligned}$$

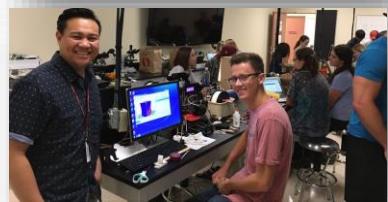
$$\begin{aligned}j'_n \cdot g &= u^2 + 3\sqrt{u-1} \quad u = x^{\frac{n}{2}} + 1 \quad j'_x = \frac{1}{2}x^{\frac{n-2}{2}} \\&= (u^2 + 3\sqrt{u-1})_{\frac{n}{2}} \cdot (x^{\frac{n}{2}} + 1)'_{\frac{n}{2}} = (2u^{\frac{n}{2}} + u^{\frac{n-2}{2}})^* 4x \quad j'_x = (2x^{\frac{n}{2}} + 2\sqrt{x^{\frac{n}{2}}-1})^* 4x \cdot \frac{3}{2\sqrt{u}} \\&\frac{3}{2\sqrt{u}} \cdot 4x \quad j'_x = (2x^{\frac{n}{2}} + 2\sqrt{x^{\frac{n}{2}}-1})^* 4x \cdot \frac{3}{2\sqrt{u}} \\&\frac{3}{2\sqrt{u}} \cdot ((1+\frac{2}{x})^{\frac{n}{2}})^* ((1+\frac{2}{x})^{\frac{n}{2}})^* \cdot \frac{3}{2\sqrt{u}} \cdot 4x \\&\frac{3}{2} \cdot (1+\frac{2}{x})^{\frac{n}{2}} \cdot \lim_{x \rightarrow \infty} \sqrt[2]{f(x)} = \sqrt[2]{\lim_{x \rightarrow \infty} f(x)} \\&\lim_{x \rightarrow \infty} b^{\frac{n}{2}} = b^{\frac{n}{2}} \quad b = \text{const} \cdot \lim_{x \rightarrow \infty} f(x) = \\&\lim_{x \rightarrow \infty} \log_b f(x) = \log_b (\lim_{x \rightarrow \infty} f(x)) \quad c = \text{const} \cdot \lim_{x \rightarrow \infty} f(x)\end{aligned}$$

Bioengineering



Yuling Yan

- **Strong and sustained student enrollment**
- **Proven faculty and student academic achievement**
 - High impact journal publications, extramural research grants and IP
- **Strong industry networks and collaborations**
 - JOINN Innovation Park - Biotech Acceleration Campus, Bayside BioSciences Inc., Bayer Pharmaceuticals, Genentech, Applied Materials, Intuitive Surgical, Midea Emerging Technology Center in Silicon Valley, Somnology
- **International exchange program with Shanghai Jiao Tong University**
- **New focus areas to spur undergraduate and graduate programs' growth**
 - Computational bioengineering
 - Translational bioengineering
- **Students securing positions in highly competitive, high-impact, high-paying industries**
- **Excellent job prospects for future bioengineers**
 - BME ranked #2 best engineering jobs by US News 2016
 - BME ranked best master's degree for jobs by Forbes 2017





Mark Aschheim

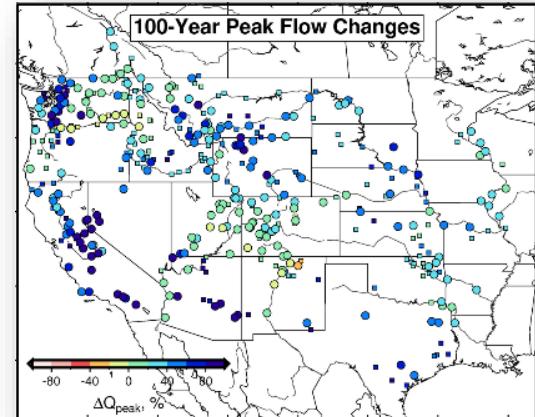


Reynaud Serrette

Civil Engineering

Starting Fall 2018:
Civil, Environmental, and Sustainable Engineering

- Construction Engineering
- Structural Engineering
- Transportation Engineering
 - Rachel He is working with and UW-Madison modeling travelers' behavior change in automated transportation systems and vehicle-to-vehicle (V2V) transportation logistics theory and simulation
- Environmental and Sustainable Engineering
 - Bold, visionary plan for a new multidisciplinary curricular and research initiative across the School
 - Water and energy sustainability, wastewater treatment and reuse, air quality, sustainable solid waste management, hazardous waste remediation, renewable resources, sustainable design and infrastructure, and the food-energy-water nexus
 - Hiring 2 new faculty – sustainable infrastructure design
- Water Resources Engineering
- Geotechnical Engineering



Computer Engineering



Nam Ling

Fastest growing department in School of Engineering

- About 400 undergrad majors and 400 grad majors
- 22 full-time faculty (15 tenure-stream) by Fall 2018
- About 20-25 part-time adjunct faculty
- 1 post-doc, 8 visiting scholars
- **Faculty Research**
 - Data storage systems
 - Information retrieval, deep learning, data mining
 - Internet of Things, Wi-Fi infrastructures
 - Machine learning, AI computational media & creativity
 - Mobile computing for social benefit
 - Security & privacy in online social media & IoT
 - Video coding and machine learning methods for video
- **Teaching & research aligned with five key emerging areas in hi-tech:**
 - Artificial Intelligence
 - Data Science
 - Cyber Security
 - Internet of Things (IoT)
 - Visualization

New Faculty:
Ying Liu



Xiang Li

New Visiting Research Scholars:

- Wenxuan Liu (with Fang);
Wei Yang (with Liu and Ling)
Shanxi Li (with Ling) (renewed)
Yixao Li (with Ling)
Qingguo Zhou (with Ling)
Jing Cui (with Ling)
Zhifeng Chen (with Ling)
Shufang Zhang (with Ling)

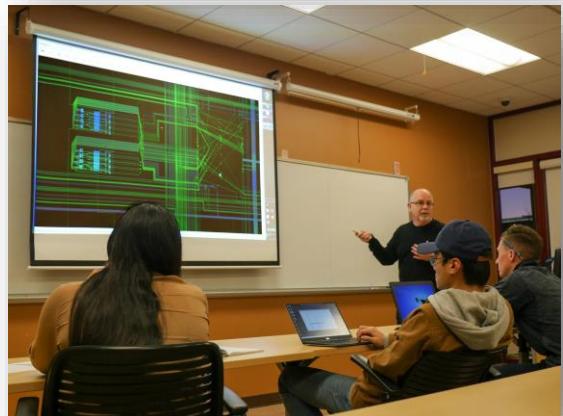
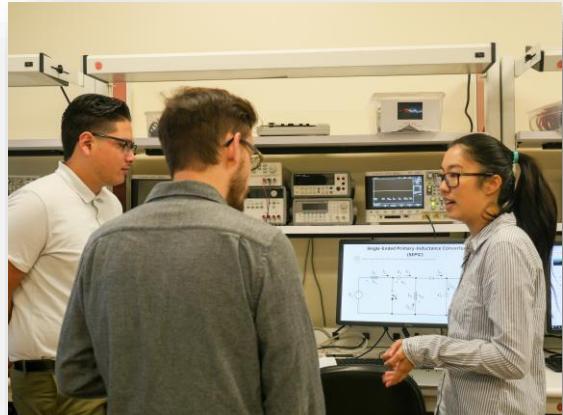


Electrical Engineering



Shoba Krishnan

- New Full-time Faculty member in the area of Electro magnetics (to start Fall '18)
 - Dr. Kurt Schab, Assistant Professor
- Emeritus Status
 - Dr. Samiha Mourad
- Program Highlights
 - New undergraduate track in computer hardware
 - Building expertise in digital architectures and cyber-physical systems
 - Development of RF and Microwave Measurement courses including BIO E & M
 - Growth in computer vision and image processing, with interest in the medical imaging and autonomous vehicle markets
 - Continued growth in power and controls for the energy sector



Engineering Management & Leadership



Frank Barone

Graduate Studies in Engineering and Technology Management

A unique Master's Program with two components:

- Training in the skills necessary to succeed as managers and leaders in high-tech businesses in Silicon Valley and around the world
- An opportunity to refresh and enhance technical skills and gain interdisciplinary knowledge



Mechanical Engineering



Drazen Fabris

Growing the graduate program, building research and educational capacity

- **Research**

- Major Grant: Understanding Mechanisms of Ultrasonic Bonding at the Atomic Scale, NSF GOALI \$328,975—P. Sepehrband and C. Tszeng
- 15 journal papers, 12 conference, \$928k in total funding

- **Faculty**

- Tenure and Promotion: P. Sepehrband
- Renewals: R. Marks (Materials), C. Tszeng (Finite Elements and Design)

- **Teaching, new and revised**

- Experiments in Material Science, N. Starostina
- Intro to Vibroacoustics, S. Saxena
- Computational Materials, P. Sepehrband
- Comsol, W. Yuen
- Revised: Medical Device Design, Mechatronics, Design of Experiments, Machine Design II, E. Sabelman, T. Restivo, and others

- **Michael Neumann, Ph.D. completed, C. Kitts**



Power Systems & Sustainable Energy

Building the Next Generation of Engineers

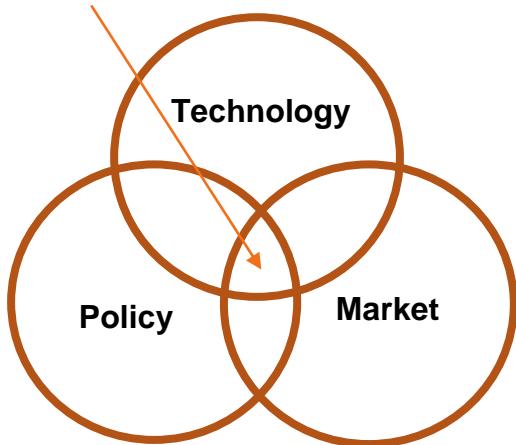


Maryam Khanbaghi

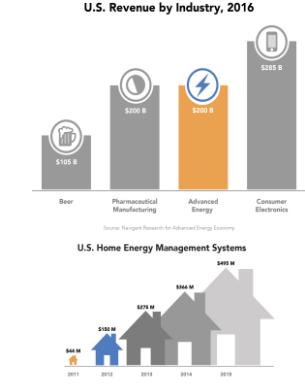
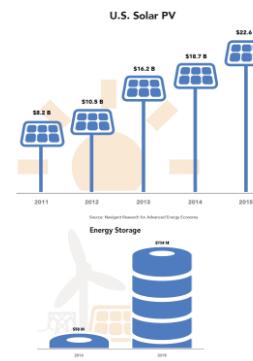
Helping the Community



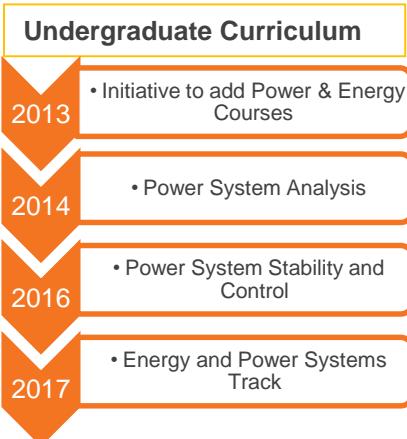
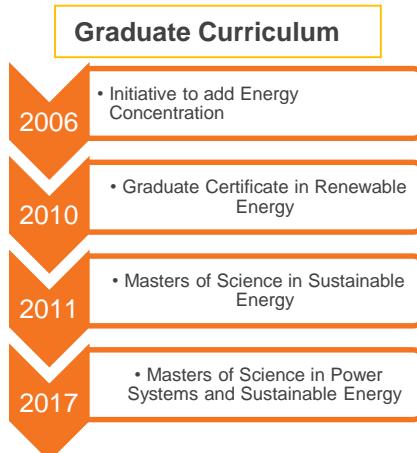
Uniqueness of the Program



Energy Economics



Revitalizing Power and Energy Curriculum



Where They Work and Industry Partners



ELECTRIC POWER
RESEARCH INSTITUTE



SUNPOWER®



Achievements

Tenure and Promotion



Yi Fang

Tenure and Promotion to
Associate Professor
Computer Engineering



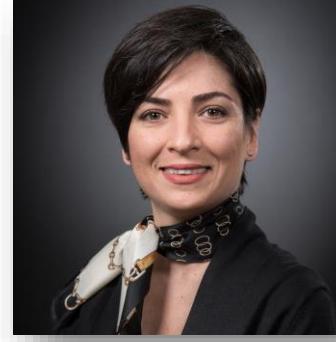
Bill Lu, M.D.

Tenure and Promotion to
Associate Professor
Bioengineering



Hisham Said

Tenure and Promotion to
Associate Professor
Civil Engineering



Panthea Sepehrband

Tenure and Promotion to
Associate Professor
Mechanical Engineering

School of Engineering Faculty Award Recipients



Prashanth Asuri
Bioengineering

Teacher
of the Year

On Shun Pak
Mechanical Engineering

Researcher
of the Year

Paul Semenza
Engr Mgmt & Leadership

Adjunct Lecturer
of the Year

Robert Marks
Applied Mathematics

Gerald E. Markle
Award



Sarah Kate Wilson

Electrical Engineering

As co-chair of the IEEE Wireless Communications and Networking Conference (first women to co-chair conference of 1,000+ registrants) received **IEEE iCon Recognition** – selected among 1600 conferences for numerous best practices achieved success in multiple dimensions

AND... received the IEEE Communications Society **Joseph LoCicero Award for Exemplary Service to Publications** "for sustained and innovative contributions to publications"

Thank you!

Questions?