SANTA CLARA UNIVERSITY
SCHOOL OF ENGINEERING

44TH ANNUAL

SENIOR DESIGN CONFERENCE

MAY 8, 2014

Thursday, May 8, 2014
Program Schedule

12:00 p.m.   **Judges' Registration**
California Mission Room, Benson Center

12:30 p.m.   **Judges' Lunch and State-of-the-School Address***
Godfrey Mungal, Dean
School of Engineering
California Mission Room, Benson Center

1:30 p.m.   **Judges' Welcome and Orientation**
Godfrey Mungal, Dean
School of Engineering
Kathryn Kale, Executive Director
Alumni Association
Ruth Davis, Associate Dean of Undergraduate Studies
School of Engineering
California Mission Room, Benson Center

2 – 5 p.m.   **Senior Design Presentations**
Benson Center, College of Arts and Sciences,
Engineering Center, The Harrington Learning Commons
and Orradre Library, Kennedy Commons

5 p.m.   **Project Demonstrations**
Engineering Quad

6 p.m.   **Dinner**
Locatelli Student Activity Center

** Due to space constraints, this event is open only
to Conference judges and invited guests.*

Dear Students, Alumni, Parents, Partners, and Friends,

Welcome to the 44th Annual Senior Design Conference. We are delighted to have you with us for this exhibition of our students' work.

At the School of Engineering, it is our goal to transform students' lives through distinctive engineering education that honors Santa Clara's Jesuit, Catholic tradition while also taking inspiration from Silicon Valley's innovative, entrepreneurial ethos. We aspire to educate engineers who advance technological innovation and entrepreneurship in the service of humanity. Today's presentations showcase the mix of hands-on, practical experience, and theoretical learning that enables our students to graduate with the knowledge, skills, and vision necessary to make a difference in their communities and in the world.

Through a wide range of capstone projects—everything from genome editing promoting regenerative medicine to straw bale construction for sustainable building to mobile apps for the homeless to improved satellite communications for NASA—our students have spent their senior year using their knowledge for the betterment of society, putting theory into practice, and, in many cases, working collaboratively across disciplines.

As we continue on our second century of excellence in engineering education, we are ever mindful of the community of Bronco engineers who bring distinction to Santa Clara University. We congratulate our seniors for their accomplishment in bringing their projects to fruition, and we thank those of you who have contributed to their success and to that of the School of Engineering.

Sincerely,

Godfrey Mungal, Dean
School of Engineering

Kathryn Kale '86, Executive Director
Alumni Association

BIOENGINEERING SESSION 1

Arts and Sciences, Wiegand Room

2 – 2:30 p.m.

Packed Bed Reactor Dialysis Cartridge Utilizing Microencapsulated Urease

Matthew Hart, Joshua Luna, Andrew Nam, Eunice Tsai
Advisors: Prashanth Asuri, Maryam Mobed-Miremadi

The project aims to develop a packed bed reactor containing microencapsulated urease that could be attached to peritoneal dialysis equipment, thereby shortening the time a patient must remain attached to stationary subsystems. We will be testing the integrity of the alginate microcapsules, determining enzyme activity, and assessing packed bed reactor optimization.

2:35 – 3:05 p.m.

POSEIDON: Perennial Endograft System

James Brennan, Valerian Lee, Stepanus Widjaja
Advisor: Gerardo Noriega

Abdominal aortic aneurysms (AAA) affect about 24 million people worldwide and are the cause of death of millions, including the world-renowned scientist, Albert Einstein. We are developing a novel stent-graft design that aims to modulate the flow in the AAA and promote healing, and thus prevent AAA rupture.

3:15 – 3:45 p.m.

Continent Prosthetic Reservoir

Marissa Crosetti, Jeffrey Dunbar, Lia Vosti
Advisors: Gerardo Noriega, Shane Rogers

Recepticol replaces functions of the large intestine and/or rectum in patients requiring a partial or total colectomy. It serves as an internal reservoir for fecal matter, drained by catheter insertion. This alternative to current treatment options will significantly improve patient quality of life, namely patient freedom.

3:55 – 4:20 p.m.

Electrolysis Powered Micropump Utilizing Planar Check Valves

Aleen Michaelian, Connie Truong
Advisor: Unyoung (Ashley) Kim

To address the growth of point of care (POC) diagnostics, we have developed a low-power, low-cost, and compact micropump that easily integrates with lab-on-a-chip devices in POC applications. Powered by electrolysis and controlled by a planar membrane and check valves, this micropump supplies precise microliter amounts of fluid.

4:30 – 4:55 p.m.

TALENs: Genome Surgery

Carson Harms, Serena Lerkantitham
Advisor: Leilani Miller

Utilizing a novel genome editing technology to elicit targeted gene integration opens possibilities for a new and more effective approach to gene therapy. Using this approach to introduce a GFP-tagged transcription factor at its endogenous site will also allow for more accurate real-time monitoring of gene expression.

BIOENGINEERING SESSION 2

Learning Commons 129, Viewing and Taping A

2 – 2:30 p.m.

3D Printing Toward the Study of Potential Anti-MRSA Agents

Powell Fansler, Karla Geisse, Ryan Marshall
Advisor: Zhiwei (Jonathan) Zhang

At the intersection of bio-device engineering and bio-pharmaceutical studies, our purpose is twofold. We are 3D-printing a hydraulic manifold to be used in isothermal titration calorimetry (ITC), with the ultimate goal of using ITC to study the thermodynamic binding parameters of potential anti-MRSA agents to our drug target, Sortase A.

2:35 – 3:05 p.m.

Reverse Protein Engineering of Luciferase

Kahler Bugtong, Skyler Herczeg, Abraham Munoz, Alexandra Obata
Advisor: Zhiwei (Jonathan) Zhang

Luciferase is a bioluminescent protein obtained from fireflies (*Photinus pyralis*). Our goal is to reduce the size of luciferase while retaining its original function, characterize its active site, and increase its applications in biomedical research. Further testing on the newly synthesized protein will compare its bioluminescent activity to the original.

3:15 – 3:40 p.m.

Genome Editing of Human iPSCs using the Cas9 System

Cade Ellis Ito, James Wolfe
Advisor: Zhiwei (Jonathan) Zhang

Human Induced Pluripotent Stem Cells (iPSCs) are important tools in both regenerative medicine and disease biology. However, advancements in the field are hindered by the inefficiency of determining iPSC differentiation. This project uses the Cas9 genome editing tool to engineer a reporter cell line that will help this process.

3:55 – 4:20 p.m.

Protein Engineering of Luciferase to Enhance Bioluminescent Properties

Charles Schwab, Peter Wittig
Advisor: Zhiwei (Jonathan) Zhang

Bacterial luciferase is the protein responsible for bioluminescence in certain deep-sea organisms. We are introducing luciferase to *E. Coli* cells and performing site-directed mutagenesis to search for mutant proteins with enhanced bioluminescent properties, specifically change in color and light intensity.

4:30 – 4:55 p.m.

IAP Inhibitors as Potential Tools for Ovarian Cancer Therapy

Aditi Bellary, Marko Buljan
Advisor: Zhiwei (Jonathan) Zhang

We aim to better understand epithelial ovarian cancer by investigating a signaling pathway that allows tumor cells to evade death. Our research examines how agents that inhibit cells' inherent pro-survival proteins can mediate their sensitivity to drugs, especially in cell lines that have developed a resistance to certain chemotherapy regimens.

BIOENGINEERING SESSION 3
Bannan Engineering Labs, Frugal Innovation Lab

2 – 2:30 p.m.

Microchip Capillary Electrophoresis

Scott Hardy, Daniel Shull, Mark Vinopal
Advisors: John Birmingham,
Unyoung (Ashley) Kim, Steven Suljak

Many neuromuscular diseases can be caused by irregular amounts of bioamine neuromodulators. To this end, we designed and implemented a microfluidic device to quickly and precisely detect concentrations of bioamines in a sample. Such a device could analyze hemolymph from the *Cancer borealis* crab, which contains many bioamines found in humans.

2:35 – 3:05 p.m.

Electrochemical Detection of Arsenic Using a Microfluidic Sensing Platform

Ben Demaree, Allie Sibole,
Jessica VanderGiessen
Advisor: Unyoung (Ashley) Kim

Arsenic contamination of water sources is a global health concern affecting up to 200 million people. This proposed device, consisting of a three-electrode system and disposable substrate, allows for point-of-use detection of arsenic when integrated with an electrochemical analyzer and mobile application.

3:15 – 3:45 p.m.

EndoCATH® Occlusion Balloon Catheter Bubble Elimination during Preparation

Adam Hall, Cameron Mar,
Samantha Nguyen
Advisor: Paul Davison

SentreHeart's occlusion balloon catheter for left atrial appendage ligation surgery introduces bubbles within the contrast during preparation. Bubbles present a safety concern, potentially escaping and entering the bloodstream and posing risk of stroke for the patient during surgery. The goal is to find a solution by modifying SentreHeart's current product.

3:55 – 4:20 p.m.

Design of Methane-to-Methanol Conversion Device

Pankti Doshi, Jessica Garcia
Advisor: Prashanth Asuri

Despite the abundance of natural gas, petroleum still remains the world's main source of energy. This is because natural gas is usually found in isolated reserves and is challenging and expensive to transport. We will address these problems by inventing a low-energy, high-volume process to convert methane to methanol.

BIOENGINEERING SESSION 4
Learning Commons 133, Viewing and Taping B

2 – 2:30 p.m.

Designing a Biomimetic Primary Cell-Based 3D Culture System for Neurotoxicity Screening

Teresa Cauvel, Jessica Kost,
Nicolo Mendoza
Advisors: Prashanth Asuri,
Christelle Sabatier

The goal of this project is to develop a hydrogel scaffold that replicates the physiological environment of spinal cord neurons, and optimize the system to promote primary neuron survival, maturation, and axonal outgrowth *in vitro*. The most immediate application of the project is improving cytotoxicity testing in early stage pharmaceutical development.

2:35 – 3:05 p.m.

Optimizing the Performance of an Alginate-Based Stent for Mammalian Cell Immobilization

Alissa Johnston, Jeffrey Kunkel,
Samantha Meredith,
Katherine Sapozhnikov
Advisors: Prashanth Asuri,
Maryam Mobed-Miremadi

Stent implantation is a common treatment for atherosclerosis, but there are problems with current metal stent designs. As a solution, our project focuses on optimizing the membrane stability of biodegradable hydrogel-based stents. Experimental testing allows us to enhance the membrane permeability and mechanical strength of our mammalian cell-encapsulated alginate stent.

3:15 – 3:45 p.m.

Mammalian Cell-Encapsulated Transdermal Patch

Megan Anders, Jared Hara,
Jordan Tottori
Advisors: Prashanth Asuri,
Maryam Mobed-Miremadi

Transdermal drug delivery is one of the fastest growing fields in the current drug industry. Our group seeks to fabricate a human stem-cell-encapsulated transdermal patch by optimizing preservation, durability, and diffusivity to create a novel method of efficacious drug treatment.

3:55 – 4:20 p.m.

In Vitro Metastasis Platform

Justus Carlisle, Mark-Phillip Pebworth
Advisor: Prashanth Asuri

Our project focuses on the development of an *in vitro* metastasis platform. We hope to prove its utility for the study of migrating cancerous and noncancerous cells at tissue interfaces, as well as for the testing of anti-metastatic compounds in cancer research and drug development.

CIVIL ENGINEERING SESSION 1

Bannan Engineering 105

2 – 2:30 p.m.

Rainwater Catchment System at Walden West Outdoor Science School

Jessica Bolanos, Melissa Crapps, Alessandro Folchi
Advisors: Steven Chiesa, Edwin Maurer

At Walden West, children learn science as it relates to the environment and sustainability. We designed a full-scale bioswale to capture and reuse the rainwater runoff on the site. To provide an educational tool for campers, we built a model bioswale and performed water quality analyses.

2:35 – 3:05 p.m.

Mission Well Design

Mary Foran, Nonda Kozas, Daniel Lafranchi
Advisors: Steven Chiesa, Edwin Maurer

This project is designed to adequately irrigate a community garden located at the Dominican Sisters Convent behind Mission San Jose in Fremont, California. To meet the irrigation needs, a solar-powered water pump will be installed, and the existing well on the property will be brought up to city regulations.

3:15 – 3:40 p.m.

Life Water

Colin Boyle, Scott Hanson
Advisor: Edwin Maurer

Design and implementation of a rainwater collection, purification, storage, and distribution system for an orphanage in Kigali, Rwanda. Project team traveled to site for construction of system components. This water system will enable the orphanage to become more self-sufficient and independent of municipal water, which has proven to be unreliable.

3:55 – 4:25 p.m.

Design of a Low-Impact Wastewater Treatment Solution for Siladen Island in Indonesia

Kyle Astill, Charles Rymer, Joseph Sarmiento
Advisor: Steven Chiesa

Design of a low-cost, centralized wastewater treatment system for Pulau Siladen, a tiny undeveloped island in Indonesia without a sustainable sanitation method. The chosen design was based on technologies that can be used to solve sanitation issues in similar communities and potentially provide recycled water to offset potable water demands.

4:30 – 4:55 p.m.

Design of an ANAMMOX Process to Treat Sludge Processing Return Flows at the San Jose–Santa Clara Wastewater Treatment Plant

Jocelyn Barragan, Marissa Tsuruda
Advisor: Steven Chiesa

The San Jose–Santa Clara Regional Wastewater Treatment Facility is planning improvements to its sludge management system. Digested sludge will be dewatered with the production of a nitrogen-rich centrate stream. This project focuses on designing an ANAMMOX process in a sequencing batch reactor treating the centrate stream and reducing ammonia-nitrogen load.

CIVIL ENGINEERING SESSION 2

Bannan Engineering 106

2 – 2:30 p.m.

California Highway 1 Improvement Project

Marie Adams, Nick George, Shaun Shapiro
Advisor: Rachel He

This project focuses on improving traffic flow and safety on a 4-mile segment of CA-1 between Moss Landing and Castroville in Monterey County. Improvements include widening, signalization, and intersection upgrades.

2:35 – 3 p.m.

Agilent Technologies Transportation Improvement Design

Steve Ojeda-Valdez, Timothy Tran
Advisor: Rachel He

Analysis of current vehicular flow and redesign of signal timing of the intersection at Agilent Technologies' entrance. Redesign of Agilent parking campus to allow safer pedestrian and vehicle movement. In addition, geometric change of Stevens Creek Boulevard between Lawrence Expressway and Interstate Freeway 280.

3:15 – 3:40 p.m.

Design and Evaluation of a Home-Scale Arsenic Removal System

Megan Alferness, Alex Casares
Advisor: Steven Chiesa

Arsenic contamination in groundwater is a global health concern. Our goal was to develop an affordable household arsenic filter using electrocoagulation technology that reduces arsenic concentrations to safe levels. This may lead to manufacturing the filter in Southeast Asia and other regions, including the United States.

3:55 – 4:25 p.m.

Cold Climate Solar Thermal Greenhouse

Samuel Heath, Ashley Husbands, Cora Lemar, Mariko Tollan
Advisors: Tracy Abbott, Tonya Nilsson, Sukhmander Singh

The design of a cold climate solar thermal greenhouse at the Denali Education Center, utilizing a pre-existing solar thermal array to heat soil beds, thereby extending their growing season. The greenhouse will provide fresh produce to education center employees and visitors.

4:30 – 4:55 p.m.

2014 ASCE Concrete Canoe Competition

Patrick Hardy, Kendra Lane
Advisors: Tonya Nilsson, Hisham Said

Team will design, construct, and race a canoe made entirely of concrete and reinforcing materials at this year's ASCE Mid-Pac Conference taking place in Fresno, California.

CIVIL ENGINEERING SESSION 3

Bannan Engineering 107

2 – 2:25 p.m.

Bamboo Connection Designs for Seismic Areas

Erik McAdams, Jenny Van Truong
Advisors: Mark Aschheim, Tonya Nilsson

This project addresses the need for structural connections for bamboo structures in areas with high seismic activity, such as Southeast Asia. Two bamboo connections were designed, fabricated, and tested to help standardize bamboo connections while considering ease of construction, material availability, and the minimal use of manufactured materials.

2:35 – 3:05 p.m.

Ductile Bamboo Structures

Tommy Baldacci, Jonathan Chimento, John Drayton
Advisors: Mark Aschheim, Tonya Nilsson

The goal of the project is to be able to provide a structurally stable connection from masonry wall to bamboo structures in order to sustain earthquake loads of large magnitude. Areas such as Southeast Asia and Haiti have had recent large-scale earthquakes.

3:15 – 3:40 p.m.

Straw Bale Seismic Design Capacities 1

Chris Heckert, Zach Looney
Advisors: Mark Aschheim, Tonya Nilsson

Straw bale construction provides a sustainable alternative to conventional building methods. Through a series of small-scale boundary condition tests, our team aims to determine the most ductile connection details to be used in the companion project full-scale wall tests. Various mesh types and connection details are evaluated in depth.

3:55 – 4:20 p.m.

Straw Bale Seismic Design Capacities 2

Beth Avon, Brittnie Swartchick
Advisors: Mark Aschheim, Tonya Nilsson

This component of the coordinated straw bale design project examines the strength of the two full-scale straw bale walls, having different reinforcement details. The design of the full-scale test specimens, test results, and recommendations for seismic design will be described.

4:30 – 4:55 p.m.

Straw Bale Seismic Design Capacities 3

Molly Summers, Michael Zaleski
Advisors: Mark Aschheim, Tonya Nilsson

The strength of two full-scale straw bale walls having different plan lengths, openings, and reinforcement details. The design of the full-scale test specimens, test results, and recommendations for seismic design will be described.

CIVIL ENGINEERING SESSION 4

Bannan Engineering 325

2 – 2:30 p.m.

Bannan Engineering Laboratories Redesign

Pia Johanna Candelaria, John-Carlo Guevara, Andy Truong
Advisors: Tracy Abbott, Hisham Said

The project will encompass preliminary structural design, construction planning and phasing, and cost estimation of a replacement of the existing Bannan Engineering Laboratories building. Design layouts for office space, integrated classroom-laboratories, and collaboration areas will be generated to supplement the plans and specifications.

2:35 – 3:05 p.m.

National Timber Bridge Design Competition

Samuel Johnson, Diana Sanchez, Juan Valle
Advisors: Tracy Abbott, Michael Loomis

The project was a design-build wooden pedestrian bridge for the American Society of Civil Engineers' national competition. This is the first time Santa Clara University has competed in the event. After the competition, the bridge will be donated to a local agency.

3:15 – 3:40 p.m.

Mixtlan's Senior Community Center

Maria Guadalupe Perez, Priscilla Ramirez
Advisors: Tracy Abbott, Sukhmander Singh

Our project features the structural design of a one-story building that will house the elderly who have been left behind by their migrating families and will house programs that focus on improving living conditions in Mixtlan, Jalisco, Mexico. Ultimately, we will maximize space usage with the most economical materials and design.

3:55 – 4:20 p.m.

Dumbarton Rail Bridge Rebuild

Peter Perez-Hernandez, Jayson Nakaoka
Advisors: Tracy Abbott, Sukhmander Singh

Bridge-type selection and preliminary foundation design.

4:30 – 4:55 p.m.

Sacramento–San Joaquin River Delta Levee Remedial Design

Amanda Kimi, Brandon Powers
Advisor: Sukhmander Singh

Evaluating a section of levees in the Sacramento–San Joaquin River Delta in order to prevent future failures. The levees will either be designed to be retrofitted or redesigned.

COMPUTER ENGINEERING SESSION 1

Sullivan Engineering 618

2 – 2:30 p.m.

Youth StreetConnect

Kelsey Dedoshka, Kaitlin Kirasich, Katie Le
Advisor: Silvia Figueira

Youth StreetConnect consists of two mobile applications that connect young, homeless women to health services and improve their communication with health providers. One app will be used by the young women to locate and rate services, receive text messages, and access information. The other app will be used by service providers and contains tools, resources, and referrals.

2:35 – 3 p.m.

LowPower Phones

Sean Kinzer, Daniel Marks
Advisor: Silvia Figueira

Adapting cellular phones to homeless people's usage, considering that they need the battery to last longer and may not require some power-intensive features available in mainstream phones.

3:15 – 3:40 p.m.

Text to Learn

Melissa Bica, Elizabeth Donahue
Advisor: Silvia Figueira

Text to Learn is a training tool developed for social enterprises in emerging markets. It uses SMS to distribute training materials to users' mobile phones, and it provides social enterprises with a Web-based dashboard to upload and send training materials, manage users, and create SMS-based quizzes to assess users' progress.

3:55 – 4:25 p.m.

VolunteerConnect

Samira Almendras, Jesus Gonzalez, Stefan Zecevic
Advisor: Silvia Figueira

VolunteerConnect is a Web-based application designed to foster partnerships between orphanages, humanitarian organizations, and individual volunteers. The application should increase communication among these three groups to provide orphanages with the help they need the most at the local level.

4:30 – 4:55 p.m.

Web-Based Stress Tracker

Stephanie Cervi, Patrick Neill
Advisors: Barbara Burns, Silvia Figueira

In order to help The Resilient Families Project, a stress management course for at-risk families, we have created an online application to enable users to take stress examinations more frequently and record their thoughts and interactions.

COMPUTER ENGINEERING SESSION 2

Sullivan Engineering 604

2 – 2:30 p.m.

The MagicTale

Lu Cao, Albert Chang, Yetian Mao
Advisor: Maria Pantoja

An iPhone RPG action game in which players can cast magic spells by drawing different shapes on the magic circle that appears on the phone screen.

2:35 – 3:05 p.m.

SCU "onCampus" iOS App

Armando Acosta, Michael Campos, Neil Chintala
Advisor: Maria Pantoja

Visitors to SCU are often unaware of information that could be useful to them based on their location on campus. Our objective is to build a mobile application that allows users on campus to share useful information. The application will interface with Bluetooth Low Energy beacons to provide contextual awareness.

3:15 – 3:45 p.m.

H_2OBot Control System

Amanda Chong,
Noel Hardesty-DeMenge, Thomas Martin, Alec Shaffer
Advisor: Silvia Figueira

A mobile application built for the Android tablet to control an underwater robot. The tool enables researchers to obtain scientific readings and live feed, navigate the robot, and customize control options.

COMPUTER ENGINEERING SESSION 3

Sullivan Engineering 602

2 – 2:30 p.m.

Exchange: Web Portal

Nik Cui, Able Hsu, Nicole Maulino
Advisor: Yi Fang

Despite the Digital Age, manual interest forms and physical sign-up sheets are still prevalent at organization recruitment events, resulting in long lines and missed opportunities. Exchange is a mobile and Web solution designed to expedite information exchange and redesign the recruitment process with retention in mind.

2:35 – 3:05 p.m.

NESH.co – Web-Based Analytic and Usability Testing System

Matthew Evans, Michael Howles-Banerji, Aaraadhya Narra, Bryan Silva
Advisor: Yi Fang

To improve developer-user feedback interaction, we have developed a Web-based, event-driven analytic and A/B testing system. Event triggered snippets, embedded in clients' websites or mobile apps, send usage data to the cloud, where clients can observe trends in customizable graphs.

3:15 – 3:45 p.m.

Location-Based Recommendation Application

Nicholas Dario, Steven Goetter, Christopher Polson
Advisor: Yi Fang

We are constructing a mobile application that will recommend places of interest to people based on their preferences. Tags are used to identify various attributes of places and recommend those places to people who will appreciate them; we do this by matching the user's interest tags with the location's attributes tags.

3:55 – 4:25 p.m.

DigiKey

Maziar Arjomand, Michael Hirabayashi, Tejender Singh
Advisor: Yi Fang

DigiKey is a modern solution to the outdated lock and key system. Using only a smartphone, DigiKey will utilize a database of digital keys that can be used to open a lock over a Bluetooth connection. Our project offers increased security and greater convenience than traditional systems.

COMPUTER ENGINEERING SESSION 4

Sullivan Engineering 605

2 – 2:30 p.m.

TAIL: Data Structures Tutorial Website

Lauren Jauco, Ian Parker, Allison Rodriguez, Tyler Upadhyaya
Advisor: Darren Atkinson

TAIL is a pseudocode-like language designed for programmers to easily create visual representations of data structures. The goals of the project are to design a comprehensive language, an accompanying compiler, and a website to utilize visual learning techniques focusing on teaching data structure concepts rather than tedious programming syntax.

2:35 – 3:05 p.m.

Divy

Aidan Crosbie, Lauren Falzarano, Nicole Pal
Advisor: Dan Lewis

Divy is a file-sharing-oriented website where users can upload any kind of digital content of their own creation—be it music, video, photographs, etc.—and specify the price for which other users may download it. The site also intelligently presents users with recommendations based on past downloads.

3:15 – 3:40 p.m.

Mobile Music Streaming via Multipeer Connectivity

Mickey Keeley, David Obatake
Advisor: Ahmed Amer

An iOS application that leverages existing core frameworks and hardware technology in order to stream audio between peers in a mesh network by creating ad hoc peer-to-peer mobile networks via Wi-Fi or Bluetooth.

3:55 – 4:20 p.m.

NameBuzzer

Haiwen Chen, Diane Keng
Advisor: JoAnne Holliday

The NameBuzzer is an iOS mobile application that will help users retain the names of new acquaintances. The NameBuzzer would utilize an algorithm that is derived from proven psychological research regarding the human memory to help the individual remember the new names.

ELECTRICAL ENGINEERING SESSION 1

Learning Commons, Training and Instruction 205

2 – 2:25 p.m.

CubeSat Electronic Power System

Benjamin Lynch, Callie Wallace
Advisors: Christopher Kitts, Shoba Krishnan

Through the Santa Clara Robotics Systems Lab, we are continuing the design of a low-cost cube satellite. Our team has designed a fully functioning hybrid power system for the satellite, including solar panels, Li-Ion batteries, and supercapacitors. Our system will power the satellite, a beacon, and an additional customer payload.

2:35 – 3:05 p.m.

Wireless Potentiostat (WioStat)

Martin Chuang, Frances Hare, Beeta Modarressi
Advisors: Radhika Grover, Shoba Krishnan

NASA/Ames has requested a portable, battery operated, and wirelessly controlled potentiostat for use in their labs and space. This potentiostat is an electrical hardware that will be used in biological tests to control electrochemical experiments in conjunction with a fuel cell.

3:15 – 3:45 p.m.

Supercapacitor Power Management Module

Michael Brooks, Anderson Fu, Brett Kehoe
Advisor: Timothy Healy

The purpose of this project is to create controlling circuitry to manage the charging and discharging of energy into a supercapacitor array. The circuitry and supercapacitor array will be integrated into a sleek module that will allow for ease of use in future designs as an energy storage system.

3:55 – 4:25 p.m.

Pb: Project Battery—A Portable In-Home Power System

Devin Blaney, Brian Fahey, Amanda Tran
Advisor: Timothy Healy

We will design and build a portable in-home power system for a small village in a developing country. We plan to install solar panels that will charge many batteries, which will be placed in each home along with circuitry to power devices such as cell phone chargers and lights.

ELECTRICAL ENGINEERING SESSION 2

Learning Commons, Training and Instruction 203

2 – 2:30 p.m.

Greenmission: An Off-Grid Energy System

Richard Dobbins, Andrew Izawa, Tyler Marting, John Nolan
Advisor: Shoba Krishnan

Sustainable and efficient, this climate-controlled greenhouse functions as an educational tool for local pre–high school science students. Wind turbines and photovoltaics energize the structure year-round to cultivate a variety of selected crops.

2:35 – 3:05 p.m.

Solar Powered Locator Beacon

Andres Preciado, Samuel Pollock, Russell Wetherley
Advisor: Shoba Krishnan

Solar powered device that sends and receives GPS coordinates for use in a hiker distress situation.

3:15 – 3:40 p.m.

Luminant Display

JP Allport, Omar Rodriguez
Advisors: Radhika Grover, Shoba Krishnan

We have designed a large format LED display using printed circuit board technology. Our technology and design will result in a product that can be used for a broad range of commercial and hobbyist applications.

MECHANICAL ENGINEERING SESSION 1

Kennedy Commons

2 – 2:30 p.m.

AkaBot: 3D Printing Filament Extruder

Emily Albi, Kevin Kozel, Daniel Ventoza, Rachel Wilmoth
Advisor: Panthea Sepehrband

The AkaBot is a machine that intakes ground bits of waste plastic water bottles, melts them, and extrudes them as filament for a 3D printer. Our project is intended for Village Energy, an electronics business in Kampala, Uganda, which is experimenting with 3D printing its enclosures.

2:35 – 3:10 p.m.

Pure Water

Jasper Adamek-Bowers, Jamie Anderson, Peyton Harrod, Madison More, Alexander Thal
Advisors: Monem Beitelmal, Drazen Fabris

An off-the-grid water purification system is designed to deliver clean drinking water. This system utilizes concentrated heat from solar parabolic troughs to boil brackish water for the distillation process. The process of fabricating the parabolic trough and optimizing other system components (heat exchanger, control system) will be presented.

3:15 – 3:45 p.m.

Mobile Cooler for the Last Mile Distribution of Vaccines in Developing Nations

Paul Novisoff, Arturo Nunez Perez, Ryne Sitar
Advisor: Hohyun Lee

This project provides a way to safely transport vaccines for an extended range in a mobile form utilizing thermoelectric modules. The device uses an active cooling system rather than passive, allowing the container to be opened and closed while maintaining a specified temperature range for the payload.

3:55 – 4:25 p.m.

Solar Powered Absorption Chiller

Craig Carlson, Mark Coulter, Claire Kunkle, Patrick Watson
Advisor: Hohyun Lee

The Solar Absorption Chiller utilizes concentrated solar power as a heat source by collecting sun rays reflected from a parabolic mirror. This device is intended for use in developing nations with limited electricity.

4:30 – 5 p.m.

Poverty Crusher

Rob Golterman, Brian Hammond, Thien-Ryan Le, Arvin Lie
Advisor: Timothy Hight

Our goal is to design and build a human-powered rock crusher, which is safe, efficient, ergonomic, and affordable. The purpose of the device is to improve the lives of widowed women in Birendranagar, Nepal, who make a living through grueling rock crushing work.

MECHANICAL ENGINEERING SESSION 2

Benson Center, Williman Room

2 – 2:30 p.m.

Swing Wing Aerial Glider (SWAG)

Chris Barton, Robert Gomez, Matthew Kochalko, Kyle Nakagaki
Advisors: Nik Djordjevic, Drazen Fabris

The objective of this project is to create a dynamic (swing) winged drone that will improve flight performance by utilizing moving wings during flight. Through wind tunnel testing of several models, we will design a new type of drone that can be used in a variety of reconnaissance missions.

2:35 – 3:10 p.m.

VEX Robotics

Ho Joon Cha, Joshua Del Real, Jamie Kalb, Thomas Nance, Jenny Yang
Advisor: Mohammad Ayoubi

Autonomous multi-robotic systems agile enough to manipulate around obstacles with accuracy are rare. While autonomous robots are used, multi-robot clusters are still in early developmental phase. Our team is competing in the VEX Robotics Competition to demonstrate the validity of our dual robot control system.

3:15 – 3:50 p.m.

VTOL RC: BRAVE

Catherine Borst, Andrew Godin, Aaron Kakinami, Michelle La Bine, Stephanie Truong
Advisor: Mohammad Ayoubi

The Broad Range Aerial Vehicle Explorer (BRAVE) is a miniature aircraft modeled after the V-22 Osprey. Its propellers can tilt upward for vertical takeoff, then transition forward into airplane mode for greater range and longer flight time. This project is intended to aid search-and-rescue missions.

3:55 – 4:25 p.m.

RSL ROVER

Garrett Bonner, Owen Hale, Julian Pitt, Andrew Torrellas
Advisor: Christopher Kitts

The RSL Rover is a semi-autonomous vehicle for the Robotics Systems Lab. We aim to use electric motors and Arduino microcontrollers to control the steering, throttle, and braking systems on the vehicle. This mechatronic project will be used by future students to test autonomous driving with new components.

4:30 – 5:05 p.m.

Mini ROV

Jorge Guerra, Robert Heinevetter, Tristan Morris, Killian Poore, Alexandra Waschura
Advisor: Christopher Kitts

Mini ROV is an underwater remotely operated vehicle (ROV) that will be used for conducting scientific research. The ROV was designed to be low-cost,

portable and user friendly. It will be operated and maintained by the Robotic Systems Lab and Santa Clara University students.

MECHANICAL ENGINEERING SESSION 3

Benson Center, Parlor B

2 – 2:30 p.m.

Waterproof Pocket Technology

James Anderson, Joey Arico, Michael Grinnell, Connor Schwab
Advisor: Robert Marks

Design of a fully waterproof pocket that can be retrofitted into outdoor apparel to keep valuables safe and protected from damage from the outdoor elements.

2:35 – 3:10 p.m.

Aeroponic Testbed for Hypergravity

Shane Brunner, Theron Hawley, Michael Nichols, David Patzelt, Kurt Sprouse
Advisors: Nik Djordjevic, Robert Marks

The goal of this project was to design and build a rotating testbed to observe how plant growth is affected when subjected to hypergravity.

3:15 – 3:50 p.m.

Santa Clara Human-Powered Vehicle 2013–2014

Peter Chester, Luis Flores, Ian Jones, Ryan Nakamura, Dylan Porter, Peter Stephens
Advisors: Drazen Fabris, Calvin Tszeng

Our team designed and manufactured a human-powered vehicle that is practical,

sustainable, and efficient for short commutes. Key design features include a three-wheeled recumbent frame, aluminum tubing, a front fairing and rear tail-box, tilt steering, and cargo space. Our design was entered in the 2014 ASME Human Powered Vehicle Challenge.

3:55 – 4:25 p.m.

Shrouded Small Wind Turbine

Kristen Flannery, Michael Holligan, Joseph Soares
Advisors: Nik Djordjevic, Drazen Fabris

The goal of this project is to increase both the duration for which small wind turbines can be used at peak efficiency and their total operating time. Our design will accomplish this by mounting a nozzle/diffuser shroud to a small wind turbine to amplify the local inlet velocity.

MECHANICAL ENGINEERING SESSION 4

Benson Center, Parlor C

2 – 2:30 p.m.

Manual Charging Phone Case

Dante Eley, Nicholas Mason, Laurence Pringle
Advisor: Calvin Tszeng

A manually powered charging phone case through the use of electromagnetic induction. Enables the user to charge a phone on-the-go, independent of an external power source.

2:35 – 3:10 p.m.

Smart Water Heater Controller

Rebecca Barney, Rachel Donohoe, Xavier Moya, Kerbasi Ugarte, Russell Williams
Advisor: Hohyun Lee

Our project is to design an artificially intelligent controller to reduce the energy consumption of domestic water heaters. The controller will log data from wireless sensor networks powered by thermoelectric modules and then implement a machine-learning algorithm to heat water based on homeowner usage patterns.

3:15 – 3:45 p.m.

Environmental Simulation Chamber for Nanosatellite Functional Testing

Taylor Donato, Nicholas Page, Joshua Summers, Brandon Wood
Advisors: Nik Djordjevic, Robert Marks

The Nanosatellite Environmental Stimulation Chamber team includes four mechanical engineering students who sought to design and build a cost-effective testing chamber for nanosatellites for the Robotic Systems Laboratory (RSL). Fabrication of a functional testing chamber for communication hardware provided the RSL with an essential tool for product development.

3:55 – 4:25 p.m.

Benchtop Centrifuge for Material Science

Jose Lizheno, Nathaniel Tseng,
Ryan Tsuzaki
Advisor: Robert Marks

This project is a benchtop centrifuge for the purpose of separating solutions in material science research at Santa Clara University.

INTERDISCIPLINARY SESSION 1

Learning Commons 316,
St. Clare Room

2 – 2:30 p.m.

Nike Ski and Snowboard Team

Adrien Doiron, Michael Fernandez,
Victor Ojeda, Robert Ross
Advisor: Christopher Kitts

The goal of the team was to create, using Nike + sensors and incorporating other sensors, a sensor system for the sports of skiing and snowboarding that would deliver data to the user via iPhone. The system could then be used by either professionals or amateur enthusiasts.

2:35 – 3:05 p.m.

Distributed Smart Camera Network for Safety and Security

Nathan Fox, Matthew Kelley,
Christopher Rapa (Mathematics),
Christopher Yarp
Advisors: Ahmed Amer, Sally Wood

This project is based on fixing the shortcomings of current CCTV systems by augmenting them with object tracking and behavioral modeling. Implemented as a hybrid architecture, the system utilizes distributed processing modules attached to each camera, as well as central servers, to analyze traffic throughout a building and report anomalies.

3:15 – 3:50 p.m.

Wireless Impact Sensing Headband

Ryan Daly, Doug Furstinger,
Tim Sashegyi, Nicklaus Schmidt,
Mihir Shah
Advisors: Christopher Kitts,
Shoba Krishnan

Athletes who suffer repeated Traumatic Brain Injuries face severe long-term health consequences. In an attempt to find a solution to this issue, our project is to design and test a device that can sense and alert an athlete of a dangerous head impact.

3:55 – 4:20 p.m.

Arsenic Detection Project: Electronics

John Barth, Anthony Clemetson
Advisors: Silvia Figueira, Shoba Krishnan

In order to address clean water concerns in the developing world, this project designed a portable electronic interface to go with a sensor that will detect arsenic in groundwater. The electronics will power the test and present the results to the user via a cell-phone application.

4:30 – 4:55 p.m.

Mobile Audiometry Application

Kevin Nguyen, Shweta Panditrao
Advisor: Silvia Figueira

The Mobile Audiometry Application enables a mobile device to perform audiometric testing to detect users' hearing range. This project seeks to fulfill the social need for increased access to hearing testing.

INTERDISCIPLINARY SESSION 2

Bannan Engineering 326

2 – 2:30 p.m.

Legacy Borehole Project

Maza Brady, Luke Cashman, Erin Hicks,
Meghan Richey
Advisor: Christopher Kitts

The goal of our project is to design a truss structure, winch system, sensor package, and communication interface that will be used for groundbreaking scientific discoveries 1,000 meters into the extreme environment of the ocean floor.

2:35 – 3:10 p.m.

Automated Precision Passing System

Bryan Herrera, Mikiah Raffaeli,
David Savitz, Benjamin Thong
Advisor: Christopher Kitts

We aim to create a ball-throwing machine that can be programmed to throw a ball to a receiver while they are running a specific route that has been inputted into the device.

3:15 – 3:50 p.m.

Mobile Satellite Communication Station

Javier Aguera, Paulo Borges,
Andrew Clavijo, Michael Kunis,
Alex Mulcahy, Kristopher Sanford
Advisor: Christopher Kitts

A station with the ability to communicate with satellites. Station is also able to relocate in order to better support satellite mission operations.

We wish to thank the following alumni, friends, and industry partners whose participation as judges contributes greatly to the success of the Senior Design Conference.

Jeff Abercrombie '84
Calif. Dept. of Transportation

Gabriel Alcantar '08
Langan Engineering

Frank Altamura '08
Trane

Patrick Arevalo '06
Level 10 Construction

Samit Ashdhir '00
Microsoft Corp.

Catherine Avila '86
Avila & Associates Consulting Engineers, Inc.

Ernesto Avila '83
Avila & Associates Consulting Engineers, Inc.

Nikhil Balram
Ricoh Innovations Corp.

Mario Baratta '64
Baratta and Associates

Ronald Bhuleskar '11
Cisco Systems

Theodore Blosser '06
Box

Chris Brady '98
Stanislaus County Dept. of Public Works

Derrick Breska '13
Zilka Kotab P.C.

Collin Burdick '11
Accenture

Charles Cantoni '57

Davin Chan '13
San Francisco Municipal Transportation Agency

Don Chan '90
Synopsys, Inc.

Mitchell Chan '90
U.S. Air Force

Anusuya Choudhury '13

Steven Connolly '10
Devcon Construction

Ross Dakin '07
Deliv

Mark Danna '87
Owens Design

Yvonne Daverin '83
Horizon Air

Nayana Dawalbhakta '00
Hewlett-Packard Co.

Rohini Deb '13
Boston Scientific

Shrikant Deshpande '99
Polycom, Inc.

Hayley Dickson '13
Forell/Elsesser Structural Engineers

Laura Draxler '88
CodeLab CleanTech

Travis Duncan '12
Rudolph and Sletten

John Ertel '82
Corning West Technology Center

Ryan Escober '05, '07
Lockheed Martin Space Systems

James Foley '68
James W. Foley, P.E.

Chris Freitas '84
Santa Clara County Land Development Engineering

Michael Freitas '70
Freitas + Freitas Engineering and Planning Consultants, Inc.

David Fry '83
Fry's Electronics, Inc.

Guillermo Gallardo '13
Fujifilm Dimatix

Todd Goolkasian '85
Cornerstone Structural Engineering Group, Inc.

Jim Gotterba '74
ALZETA Corporation

Gavin Hagiwara '12

Asheet Hakoo '05
EMC

Ron Hansen '72
RLH Engineering, LLC

Matt Hayes '91
Hayes Manufacturing Services, Inc.

Bernie Henschke '58

Chris Ho '08
STMicroelectronics

Meg Howe '10

Scott Hsu '06, '10
National Instruments

Alexandra Jabuka-Godwin '13
VTA

Brian Janjic '89
IBM

Donald Johnson '59
Lockheed Martin Space Systems

Sheila Johnson '84
Lockheed Martin Space Systems

John Judnich '13
Lytro, Inc.

David Kojima '11
Blach Construction Co.

Dane Kornasiewicz '13
Asante Solutions

Daphne Korthamar '99
California Public Utilities Commission

Sujit Kotwal '91
Kilpatrick Townsend & Stockton LLP

Jeff Krenek '87
Hewlett-Packard Co.

Kristen Kristich-Madar '03
Versonix

Rob Lathrop '94
Lathrop Engineering

Ryan Leary '08
Opower

Frank Lee '87
PaaxSoft

Charles Leone '05, '09
Apple, Inc.

Doug Leong '90
Netgear

Mike Liu '04

Avery Lu '95
CASPA

Paul Lum '81
California Institute of Quantitative BioSciences

Mark Maloney '93
Rohde & Schwarz, Inc.

Jasdeep Mangat '08
The Whiting-Turner Contracting Co.

Bhaskar Mantha '79
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Brian Mapel '93
BMA Construction Engineers, Inc.

Joseph Mastroieni '73
Diocese of San Jose

Clarence Mayott '12
Linear Technology

Don McIntosh '66
AMD

Anthony Mei '70
U.S. Army Corps of Engineers

Chris Menezes '10
Disney Interactive

Giovanni Minelli '06
Naval Postgraduate School

Eric Monsef '96
Hewlett-Packard Co.

Colby Moore '10
4Taps

Robert Mullen '85
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Michaela Nava '13
Quilici Engineers, Inc.

Tuan Nguyen '08
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Alec Nicholas '12
Biggs Cardosa Associates, Inc.

Renee Niemi '86
Plantronics

Paul Nuti '93
Veritas Environmental Consulting, Inc.

Carla Ochoa '08
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Joseph Oloju '11

Jeff Pangborn '03

Tina Panontin '83
NASA Ames Research Center

Steve Pieracci '04
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Ross Pimentel '12
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Joe Quilici '79
Quilici Engineers, Inc.

Glenn Roberts '71
City of Palo Alto

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Greg Rodrigues '79
Hohbach-Lewin, Inc.

William Rosario '12
Maxim Integrated

Phillip Satterfield '00
Apple, Inc.

Sean Schiff '09
Sportvision

Ryan Schmidt '96
Pxt Consulting

Casey Schulz '04
Fatdoor

John Seubert '12
Personal Capital

Nirav Shah '05
Shreeji Services LLC

Carl Simpson '79
Coronis Medical

Gopal Singh '11
Texas Instruments

George I. Skoda '74, '80

Daniel Stadulis '08
PG&E

Eric Steuben '90
Asante Solutions, Inc.

Gordon Stitt '80
Nebula

David Stubben '73

Mark Swoboda '09
ANSYS

James Taguchi '11
Federal Reserve Bank of San Francisco

Jason Tan '13
Broadcom Corp.

Paul Twining '12
Texas Instruments

Donald Van Buren '70

Evor Vattuone '68
Northrup Grumman

Ursula Vaughan '10
Hayes Manufacturing Services, Inc.

Peter Vellios '00
Aerojet Rocketdyne

Henry Wang '96
Tesla Motors

Michael A. Wang '93, '97
Macronix

Kassie Watson '92
Edward Kraemer & Sons

Curtis Wong '10

Haig Yengoyan '95, '07
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Jose Ysaguirre '79
QualiTau, Inc.

Josergio Zaragoza '13
Santa Clara University

Alexander Zatopa '13
St. Jude Medical