FRED AND HARRIET COX
SENIOR DESIGN
COMPETITION

SPRING 2015

MAY 7, 2015

UNLV | Howard R. Hughes College of Engineering

Fred and Harriet Cox

Senior Design Experience

Part of every UNLV engineering student's academic experience, the Senior Design project stimulates engineering innovation and entrepreneurship. Each student in their senior year chooses, plans, designs and prototypes a product in this required element of the curriculum. Working in teams, the senior design project encourages students to use everything learned in their academic program to create a practical, real world solution to an engineering challenge.

Beyond the classroom

Because of the requirement to work in teams, students also build good communication skills, presentation skills, and even business writing skills. They also have to source and purchase the materials for the prototypes themselves, giving them real-world budgeting experience.

Reward and Recognition

A team of industry judges choose winners in each category based on innovation, commercial potential, presentation quality and sustainability. Cash prizes for first and second place are given in each discipline, as well as prizes for sustainability, commercial potential, interdisciplinary and the competitions grand prize. Through the generosity of patrons Fred and Harriet Cox as well as award sponsors, the College of Engineering reimburses teams for the costs associated with creation of their prototype. This ensures that teams are not working under unfair financial constraints, but have the resources they need to excel.

Taking it Further

Senior Design teams are offered the opportunity to partner with MBA students from the Lee Business School to create a business plan as part of the MBA curriculum. This collaboration has led to great success at the Dominic Marrocco Southern Nevada Business Plan Competition, the Governor's Cup and the subsequent creation of many successful businesses.

Get Involved

Teams often get project ideas from industry partners or friends of engineering who have an interesting problem or concept they would like to submit. Teams may also be looking for an industry mentor or coach to help them throughout the year.

Industry partners and individuals are also offered the experience of sponsoring an award category. To find out what categories are available, or for other sponsorship information, contact Molly Marks at molly.marks@unlv.edu or (702) 895-3281.

Senior Design Clinic

Recently the College of Engineering launched the Rebel Project, a unique experience in which companies will be able to partner with the students to work on specific challenges to find business solutions. To get involved in this exciting new venture, please contact Professor Pushkin Kachroo at pushkin@unlv.edu or (702) 895-4926

Thank you to our Sponsors!

National Security Technologies LLC
Vision • Service • Partnership

JT3

Zappos.com
the web's most popular shoe store!

switch

Dominic Anthony Marrocco

MountainWest
Technology Accelerator

NVEnergy

CIRQUE DU SOLEIL

MGM RESORTS INTERNATIONAL

Thank you,
Spring 2015
Senior Design Instructors!

Department of Civil & Environmental
Engineering and Construction
Dr. David Ashley

Department of Computer Science
Dr. Evangelos Yfantis

Department of Electrical and Computer Engineering
Brandon Blackstone

Department of Mechanical Engineering
Dr. Zhiyong Wang

Senior Design Competition

Presentation	Time	Project Title
PRESENTATION 1	8:00 A.M.	Mini Baja Drive-Train
PRESENTATION 2	8:15 A.M.	Autonomous Security
PRESENTATION 3	8:30 A.M.	Wunder
PRESENTATION 4	8:40 A.M	Precision T-Shirt Cannon
PRESENTATION 5	8:55 A.M.	Wireless Airvent
PRESENTATION 6	9:10 A.M.	The Big Sleep
PRESENTATION 7	9:20 A.M.	Wireless, Damper-fed
PRESENTATION 8	9:35 A.M.	Saving Chad
PRESENTATION 9	9:50 A.M.	Hybrid Quadcopter
10:15 A.M. - 10:30 A.M. BREAK		
PRESENTATION 10	10:40 A.M.	Hydrocyclone-
PRESENTATION 11	10:55 A.M.	Compact Integrated
PRESENTATION 12	11:10 A.M.	Volume Man
PRESENTATION 13	11:20 A.M.	The Wet Strip (Longest
PRESENTATION 14	11:35 A.M.	Structural Teflon Micro
PRESENTATION 15	11:50 A.M.	A High Power EM
PRESENTATION 16	12:05 P.M.	Violin Education App
PRESENTATION 17	12:15 P.M.	Robohand
12:30 P.M. - 1:35 P.M. LUNCH		

Presentation Schedule

	Department
System	Mechanical Engineering
Rover	Electrical and Computer Engineering
	Computer Science
	Mechanical Engineering
	Electrical and Computer Engineering
	Computer Science
Air Delivery System	Mechanical Engineering
	Civil Engineering
	Mechanical Engineering
Oil/Water	Mechanical Engineering
Processor	Electrical and Computer Engineering
	Computer Science
waterslide in the world)	Civil Engineering
Thrusters	Mechanical Engineering
Radiation Meter/Warning System	Electrical and Computer Engineering
	Computer Science
	Mechanical Engineering

Presentation	Time	Project Title
PRESENTATION 18	1:40 P.M.	The FML Project
PRESENTATION 19	1:55 P.M.	Smart Directional Control
PRESENTATION 20	2:10 P.M.	AdjusTABLE
PRESENTATION 21	2:25 P.M.	Dynamic Electric Heater for
PRESENTATION 22	2:40 P.M.	Recoil
PRESENTATION 23	2:55 P.M.	Retaining Wall Remediation
PRESENTATION 24	3:10 P.M.	Particulate P.O.D.
3:25 - 3:40 P.M. BREAK		
PRESENTATION 25	3:45 P.M.	Autonomous Object-Finding
PRESENTATION 26	4:00 P.M.	Optogenetic Stimulator
PRESENTATION 27	4:15 P.M.	Dynamic Diodes
PRESENTATION 28	4:30 P.M.	Compressive Stockings

Presentation Schedule

	Department
	Mechanical Engineering
of Vehicle AC Vents	Electrical and Computer Engineering
	Mechanical Engineering
Hookahs	Electrical and Computer Engineering
	Mechanical Engineering
and Reinforcement	Civil Engineering
	Mechanical Engineering
Robot	Electrical and Computer Engineering
	Electrical and Computer Engineering
	Mechanical Engineering
	Electrical and Computer Engineering

Spring 2015 Senior Design Judges

Laurence A. Feldman

Laurence A. Feldman served as Senior Staff Member of Los Alamos National Laboratory. Feldman has spent over 40 years working in the field of aerospace engineering and computer science. During his career, he went from the old punch tape and keypunch cards to the world's fastest supercomputers and high-speed graphics devices. While serving in the Air Force, he worked at the Air Force Weapons Laboratory, Air Force Rocket Propulsion Laboratory, Lawrence Livermore Laboratory and the Air Force Armament Laboratory. Through his work, he developed computer software to analyze solid rocket design and trajectory performance, magnetohydrodynamics (energy research), and computational fluid dynamics (aerodynamics). Simultaneously, he developed supporting computer graphics, employing 2-D, 3-D, animation and current multimedia technology. After retiring from the Air Force Reserves as a Lt. Colonel, he did contract work including generating a database model, which is currently deployed aboard the Space Shuttle to aid rehearsal of approach and landing operations. He founded software company Creative Visual Software, where he developed a 3-D geometric modeler and scientific visualization. He also worked as a 3-D software architect for Intel Corporation, and British game company where a developed a "3-D Engine" for use in games for the Nintendo, Sega, and PC computers. He serves as Executive Director of LaxPower.com. He has attended the University of Pennsylvania, University of Oklahoma, University of Southern California, University of California, Berkeley, Auburn University and Stanford University. He has received five awards for his work, including first prize in an IBM supercomputing contest, two Cray Research Supercomputer "Gigaflop" awards, and Autodesk First Prize in Scientific Graphics, and first prize in MicroCad Magazine's Engineering Graphics Contest.

Rish Mehta

Mehta brings more than 15 years of hardware and software engineering and product management experience to Banjo. An innovator by nature with several patents, Rish previously led a team that pioneered social integration into mobile in the days before smart phones were ubiquitous. His entrepreneurial roots run deep. He developed several new startups for Intel Capital's New Business Initiatives and co-founded the mobile technology company, Blipstream, which was sold to Trilibis Mobile in 2009. Rish holds a BS in Electrical Engineering and Computer Science from the University of California at Berkeley.

Frank Milligan

As the Director of the Environmental, Health, Safety and Corporate Security Department, Frank Milligan oversees the comprehensive programs of environmental health/safety and corporate/operational security for the Las Vegas Valley Water District, Southern Nevada Water Authority and Springs Preserve.

Mr. Milligan brings nearly 26 years of safety management experience to this position. He retired from the U.S. Air Force after 21 years of service, beginning the first five years of his military career in law enforcement and the remaining in safety management. Prior to joining the district in 2007, he served five years as the Southwest Regional Environmental Health and Safety Manager with CH2M Hill, a global organization contracting with Nellis Air Force Base, Edwards Air Force Base, Hill Air Force Base, and China Lake Naval Air Weapons Station.

Originally from South Carolina, he has been a Nevada resident since 1999. He holds degrees in criminal justice, human services and safety administration, and he has a Master of Arts in organizational management. He serves on the Board of Directors for the American Red Cross Southern Nevada Chapter, Southern Nevada Area Communications Council (SNACC), and Nevada Division of Industrial Relations. Frank is a graduate of Leadership Las Vegas and the FBI Citizens' Academy.

Suresh Vishnubhatla

Suresh Vishnubhatla is Executive Vice President, Long Term Care Operations for PharMerica Corporation (NYSE: PMC). In his role, he oversees product development, information technology, pharmacy services, clinical services, customer services and revenue cycle management for the company.

Vishnubhatla started his career at Emerson Electric Corp. and subsequently worked at BodyMedia (acquired by Jawbone) and Millennium Pharmacy Systems. His work during his career was focused on rapidly growing businesses by launching innovative products and services, building scalable platforms and developing customer focused service organizations. He owns several US and international patents and the products were recognized by several national and international publications.

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING AND CONSTRUCTION PROJECTS

Department Chair
Dr. Donald Hayes

Senior Design Instructor
Dr. David Ashley

Retaining Wall Remediation and Reinforcement

Department
Civil and Environmental Engineering and Construction

Project Participants
William Sublette, Farid Najand and Hunter Hutchisson

Instructor
Dr. David Ashley

Faculty Advisors
Dr. Barbara Luke and Dr. Sajjad Ahmad

Problem Identified
An existing residential home, located on a sand ridge overlooking a lake, features a 22 foot high tiered MSE retaining wall that is currently undergoing gradual slope failure. The property has experienced extensive damage due to the slope movement, which is estimated to be about 1.4 inches downhill per year. Inadequate design of the MSE wall and considerations for drainage and water runoff may be contributing factors in the slope and wall failure.

Current Solutions
Current solutions for the slope stability and repair of MSE walls incorporate soil nails, prestressed anchors and drilled shafts. Another solution would be the stabilization of the backfill using the previously mentioned techniques, then subsequent demolition and complete redesign of the retaining wall. Current solutions for drainage mitigation would be the use of horizontal drains, drain wells, finger drains, and a surface water runoff design.

Team's Solution
The slope stability and repair will involve the use of soil nails as one design and drilled shafts with wide flange steel columns and concrete for the other alternative design. The two designs will require further investigation in order to determine the better alternative, along with a cost analysis to help determine the feasibility of the design. The project will also include a study of drainage and water runoff in the area, which will help in the selection and implementation of an adequate drainage design. The purpose of the project is to provide an economical design that will prevent further movement of the slope and MSE wall in order to ensure the safety of the homeowners.

Saving Chad

Department
Civil and Environmental Engineering and Construction

Project Participants
Edgar Mora and Pablo Vasquez

Instructor
Dr. David Ashley

Faculty Advisor
Dr. Sajjad Ahmad

Problem Identified
Lake Chad has been a vital source of water for the surrounding countries (Chad, Cameroon, Nigeria and Niger), providing water to millions of people. However, it has undergone a dramatic change in size during the last half century. Due in part to climate change and the over allocation of water by the surrounding inhabitants, the lake is estimated to have shrunk by 10 percent of its size since 1963. The drying of the lake is a contributor to tensions between communities surrounding the lake.

Current Solutions
Solutions that have been proposed in the past include the Transaqua project, which considered transferring water from the existing Congo River through the construction of an artificial canal or channel into Lake Chad. This would add extra inflow to the Lake and in time revitalize the lake to its pre-1970s surface area. Because of political and financial issues this proposition never went into effect.

Team's Solution
We will be evaluating alternatives to mitigate the shrinkage of the lake with a diversionary canal or channel from an existing river basin southeast of the lake. In addition, the feasibility of making the canal deep enough to allow shipping of goods by boat will be evaluated. The added inflow will contribute to the economical and agricultural revival of the region and the restoration of the past ecosystem surrounding the lake. It is better than current solutions in that it will provide sufficient inflow to the lake. Our proposed solution is better than past alternatives due to the introduction of new technologies, radar imaging and softwares (GIS and HEC-RAS) that are easily available software, which will provide us with the necessary tools to conduct a feasibility study. This will give us a better understanding of the scope of the project and help cut overall costs. The surrounding countries and communities around Lake Chad will benefit from the construction of this canal as it will transform their economies and environment.

The Wet Strip

Department
Civil and Environmental Engineering and Construction

Project Participants
Mark Martini, Scott Booth, Anthony Muriuki and Andy Rezazadeh

Instructor
Dr. David Ashley

Faculty Advisor
Dr. Haroon Stephen

Tech. Advisor
White Water West

Problem Identified
In Las Vegas, summer temperatures easily reach a blistering 110 °F, and the average temperature is above 85 °F for nearly six months out of the year. In a city that has been self-coined the "Entertainment Capitol of the World" the city needs to construct more attractions and activities to do in the summer.

Current Solutions
There are currently two water parks in Las Vegas: Wet 'n' Wild and Cowabunga Bay. The parks have identical types of rides and attractions; besides location there is really no reason to visit one compared to the other.

Team's Solution
We have created a concept for the longest water slide in the world, the Wet Strip. The wet strip will provide residents with summertime activities and tourists an added reason to visit Las Vegas. It also will be a key attraction for Wet 'n' Wild, allowing it to stand out from the competition. The Wet Strip will mimick concrete flood channels; starting on top of the foothills just southwest of the current Wet 'n' Wild water park and terminating near the base of the foothill. The Wet Strip will use more than 350 feet of elevation change over a ride distance of more than 2,100 feet. Riders will be thrilled with nearly three minutes of ride time. The Wet Strip water slide will give locals a chance to cool off and the size and scale of the slide will attract thrill seekers around the world.

DEPARTMENT OF COMPUTER SCIENCE

Department Chair
Dr. Laxmi Gewali

Senior Design Instructor
Dr. Evangelos Yfantis

Wunder

Department
Computer Science

Project Participant
Jordan Mulcahey

Instructor
Dr. Evangelos Yfantis

Problem Identified
You're lost in an unfamiliar city - maybe you're stuck at a connecting airport because your flight was delayed, maybe you're here for meetings, maybe you've just made an impromptu trip to a new place. Either way, you need something to do. Most people at this point are hampered by the inconvenience of the situation. If you leave the airport or stray too far from what's around you, you may end up missing your flight or meeting, or getting sidetracked.

Current Solutions
Current solutions include TripIt, WorldMate and TripCase.

Team's Solution
Instead of sticking around the airport or the safe tourist-oriented parts of the city you're in, you open the Wunder app. You tell it when and how you're leaving and start entering activities you'd like to do (shopping, dining, entertainment, etc). From then on an artificially intelligent algorithm creates an itinerary for you, keeps you on schedule and reminds you where to go and when. The algorithm underlying this app can be biased toward choosing what's well-rated, cheap or close to where you will be when the event happens. By sourcing data from multiple business rating and reputation services (like Yelp), the algorithm can steer you toward the best the city has to offer and away from the shady parts. The algorithm's complexity will be hidden behind a simple and intuitive interface where every common action (like adding a new event) will take no more than 3-4 taps. This app is a massive improvement on the current itinerary and trip scheduling apps because they are all heavily travel and business-oriented, meaning they concentrate almost entirely on how you get to your destination as opposed to what you do when you get there. They are much more manual and time-consuming (in terms of workflow as well as interface) than this algorithm-oriented approach.

Volume Man (An Android Mobile Application For Volume Control)

Department
Computer Science

Project Participant
Oniel Toledo

Instructor
Dr. Evangalos Yfantis

Problem Identified
Students, businessmen, and individuals with smart phones have all too often experienced their phone ringtone going off during an important meeting or in a classroom. To counter this disturbance individuals usually put their phone on vibrate or silent only to forget to turn the volume back on and only later notice all the missed calls and/or notifications.

Current Solutions
Certain smartphones come with a "Do Not Distrurb" setting whereby a phone can be set to silent or vibrate at a certain time during the day. However, this functionality lacks flexibility as it does not allow one to set multiple sound settings for different hours of the day and on certain days of the week. Some apps exist on both the iOS and Android market for this but they are either lacking features, have too many features, or require the user to pay for usage of all features

Team's Solution
I propose a freely available Android application that will allow users to create sound profiles that will manage their device's volume levels at certain repeated times of the day and/or week. My solution will allow users to create a setting once and have that setting's volume specifications to be repeated until the user chooses to stop it. This solution is helpful for students who have multiple lectures on specific days throughout a school semester, employees who have important weekly meetings, and the everyday user who doesn't want their phone going off in the middle of the night. After the beta release of the application I plan on adding more features such as syncing functionality with popular calendar apps and advanced volume setting options.

Violin Education App

Department
Computer Science

Project Participant
Edward Mendiola

Instructor
Dr. Evangelos Yfantis

Faculty Advisor
Allison Garcia

Problem Identified
Music is not taught in all schools and private lessons can be expensive. People who want to learn how to play an instrument, such as the violin, may have trouble finding cheap or consolidated information.

Current Solutions
There are many violin and music teaching videos on YouTube and throughout the internet. However, it is difficult to find a good repository of information. Students often search through many different channels and websites to find good lessons.

Team's Solution
The Violin Education App will provide written, interactive lessons in one place for students interested in learning about music. Users can click through a list of lessons to read about the basics of playing the violin, without having to search all over the internet. There will be quizzes for students to take so they can test their knowledge after they have read through a lesson. There will also be a list of video lessons for users who want a more visual experience. Video performances from Edward Mendiola will be provided so students can see examples of common violin repertoire.

The Big Sleep

Department
Computer Science

Project Participant
Ryan Stiltz

Instructor
Dr. Evangelos Yfantis

Problem Identified
In the mobile gaming market we are seeing a lot of redundancy. Many games are just copies of other successful games, or just rebuilding the mechanics of them. The problem here is that it is stagnating the fun that could be done with your mobile device. Bringing new life to the mobile market is a necessity to break from the monotony of similar casino and repetitive defense tower games.

Current Solutions
Many of the games out right now are just clones of the same game. Casino games are becoming popular but we also see the same solutions for mobile gaming. I believe that a breakthrough in different styles of gaming is needed in the field.

Team's Solution
My game will implement elements of the popular games but still contain its own identity. This will be accomplished by keeping the game addictively challenging, having RPG elements, and lastly being fast paced. By combining those elements with a new style of play that will be familiar to some, I believe it would bring a new life to mobile gaming and revive some elements of gaming lost to older hand held devices.

DEPARTMENT OF MECHANICAL ENGINEERING

Department Chair
Dr. Brendan O'Toole

Senior Design Instructor
Dr. Zhiyong Wang

The Full Motion Line Array Project

Department
Mechanical Engineering

Project Participants
Faezeh Basardeh, Zachary Cook, Max Godges and Samantha Suffle

Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. Mohamed B. Trabia

Tech. Advisor
Michael Genova

Problem Identified
In the entertainment industry, Full Motion Line Array (FML) speakers are essential to the impact of a successful show. Currently, purely the muscle of those installing the system without a mechanical advantage does the adjustment of the splay angle between each speaker. Another issue that exists is the adjustment of the speakers in the z-axis once they have been rigged to the grid.

Current Solutions
The current solution for the splay angle of the speakers is Meyer Sounds Leo speaker that uses gravity to place the speakers into the proper position. As for the adjustment of the z-axis, installers must lower the array and place a delta plate on the system and then hoist it back up in hopes that the issue is resolved. This solution will only solve an issue within a few degrees. If not then the system will be brought back down and readjusted till the desired angle is achieved.

Team's Solution
Our proposal is to incorporate an all in one rigging system to give the line array system the ability to pan in a 0 to 360 degree angle. To achieve this movement, a tapered roller bearing will be incorporated to the grid structure that is to be hoisted by chain motors. This will allow the installer to adjust the angle while the system is in the air. To assist with the splay angle of each of the individual speakers, linear actuators will be utilized to enhance the mechanical advantage of this component of the structure. A PLC controller will be used to automate these modifications to eliminate the need for redundant work, which will lower labor costs as well as installation time.

Recoil

Department
Mechanical Engineering

Project Participants
Ajericho Malia, Carl Ajuziem and Jennifer Bateau

Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. Brendan O'Toole

Problem Identified
Over two-thirds of Americans own smartphones and many carry their devices' charger cables in pockets, bags and purses. The cables end up getting tangled and create unnecessary clutter for the user.

Current Solutions
Although retractable devices have been invented and put on the market, these devices require the user to purchase an entirely new cord with the retractable technology.

Team's Solution
We have developed a universal device that can be attached to an existing cable to retract it into the small, light-weight tangle-eliminator. The Recoil is easy to use and inexpensive to manufacture and will help millions of users (especially students) de-clutter their bags.

Particulate P.O.D.

Department
Mechanical Engineering

Project Participants
Eduardo Hoyeula-Alcaraz and Christopher Phillips

Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. David James

Community Advisor
SkyWorks Aerial Systems

Problem Identified
There are several agencies in the United States that monitor air quality to prevent deterioration and contamination of our nation's air. To accomplish this, constant sampling and evaluation are conducted to maintain an accurate database and monitor pollutants. These pollutants can cause health problems, harm the environment and cause property damage.

Current Solutions
Currently, monitoring is mainly done by an established network of air monitoring stations. The infrastructure of such stations is costly, non-mobile and permanent.

Team's Solution
We are proposing the development of a mobile aerial platform for air quality monitoring using a small unmanned aerial vehicle (UAV) paired with a low cost air particulate sensor. This will be a low cost robotics solution that can eliminate multiple high cost monitoring stations. It can be used even in extremely hazardous environments where a human cannot enter or access.

Hydro-Cyclone: Oil/Water Separator

Department
Mechanical Engineering

Project Participants
Sean McCracken and James Jacobs

Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. Darrell Pepper

Problem Identified
The petroleum industry in the United States seeks to remove oil deposits from underground shale formations. These formations are associated with three main fluid types: oil, water, and gas; two being target fluids. The target oil cannot be sold to oil hauling and pipeline companies if the amount of water found in the oil exceeds 99 percent.

Current Solutions
Current solutions for on shore oil production include a system of three phase separation and line heating devices that rely on gravity and retention time to allow for target fluids to settle out of the well stream. Inline hydro-cyclones are also being used offshore, due to the smaller footprint of the equipment removal of 95% of the water from the target oil and gas; they are used to prevent bottle necking at midstream facilities. Chemical can also be applied to well stream fluids at surface or down hole to reduce the amount of emulsion and foam ability of the well stream fluid. Chemical is primarily used at on shore oil locations.

Team's Solution
The current three phase separators that rely upon gravity and retention time to separate out well stream fluids are large, heavy, contain multiple pieces of equipment and associated costs and are sensitive to emulsion and foaming of the well stream fluid. Hydro-cyclones that are currently in use off shore are not in use on shore and do not separate out higher than 95% of the water from the target fluid, the oil. Hydro-cyclones due to their shape are able to induce the force equal to multiple times that of gravity. Vortex finders on the current technology utilize stationary locations and are meant to be used at one particular flow rate for efficiency. The team's solution was to create a piece of equipment that could change the depth of the vortex finder and the relative angle to gravity in order to find a combination at all flow rates that would separate out more than 99 percent of the water from the target fluid. The beneficiaries for this technology are oilfield midstream facilities, L.A.C.T (Lease Automatic Custody Transfer) unit suppliers, oilfield service companies and oilfield leasing companies.

Robo-hand

Department
Mechanical Engineering

Project Participants
Daniel Perlstein, Christopher Denton, Cliff Williams and Dulaya Saennok

Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. Brendan O'Toole and Dr. Mohamed Trabia

Problem Identified
There are many problems with current prosthetic hands. First of all, many high quality prosthetic hands are very expensive which makes them out of reach for the average person, often costing tens of thousands of dollars. In addition, many free or affordable hands are completely mechanical with limited precision, quality, accuracy, and durability.

Current Solutions
There are many designs for prosthetic hands, but not too many that are robotic and inexpensive. One currently on the market is the Flexy-Hand 2 which utilizes the wrist movement of an individual to open and close the hand to grip different objects.

Team's Solution
The solution is to design a very affordable prosthetic hand that utilizes the 3D printed Flexy-Hand 2 technology with many important improvements and modifications. The new prosthetic hand will go from purely mechanical to automated, with the assistance of a power screw, sensors, and a motor. In short, when an individual wants to use their hand, a sensor picks up movement in the individuals arm to open and close the prosthetic hand to grip most everyday objects. This design exceeds the current solution because it will allow for the user to grab heavier objects with ease. In addition, the new prosthetic hand will improve quality, accuracy, durability, and precision while still being affordable. Those with deformities of the hand and amputees will benefit with this new design.

Precision T-Shirt Cannon

Department
Mechanical Engineering

Project Participants
Jake Knighton and Josh Hand

Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. Woosoon Yim

Problem Identified
Promotional t-shirts are frequently distributed at sporting and other events via a t-shirt "gun." The point is to have the ability to reach as many customers as possible. However, there is no accounting for accuracy as current guns are primarily point-and-shoot. This leaves the promoter without the capability to target a specific section for t-shirt distribution.

Current Solutions
Most current designs have focused on factors other than accuracy. Designs include a robotic chassis, Gatling-style launchers and guns with increased range. Another variation, the remote controlled blimp, has some accuracy capability but is not very exciting to the spectator.

Team's Solution
Our ground-mounted cannon is designed to hit a target at 100 ft., within a 6-ft radius, with an accuracy of at least 50%. We will accomplish this by using target location data in conjunction with ballistics equations to determine the exact firing pressure/angle combination needed to reach the given target. This is better than current solutions because it enables a promoter to deliver t-shirts to a specific group/section while maintaining the excitement of an active cannon-style design. Potential applications for a precision launcher of this type include: t-shirt distribution at promotional events, mortar simulation in paintball or military training and school raffle/ fundraising events.

Mini Baja Drive-Train System

Department
Mechanical Engineering

Project Participants
Jared Plies, Victor Chen, Shane McMahon and Giancarlo Touzard

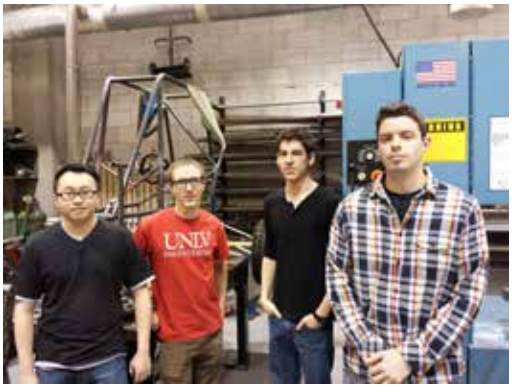
Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. Mohamed Trabia

Problem Identified
The UNLV's SAE Mini Baja competition vehicle needs a drivetrain system. The vehicle already has an engine and a continuously variable transmission (CVT). However, it needs a transaxle in order to provide a gear reduction system to achieve desired torque and rotational speed.

Current Solutions
Current transaxles available in the market are too big and heavy for this application. These units are primarily designed for bigger vehicles with more powerful engines. There is no transaxle available in the market that satisfies the needs of the SAE Mini Baja vehicle.

Team's Solution
The team will design and build a two-stage gear reduction transaxle. The design is made to be used with the Briggs & Stratton 10 HP engine and a Gaged Engineering GX-9 CVT. It will support a top speed of 35 MPH. It will also weigh less than 25 lbs. The transaxle will be compact and mounted as low as possible. This design can be sold in the market to other ATV and UTV manufacturers such as Yamaha, Mitsubishi and Polaris. It can also be sold to individual mini buggy builders as well.



Dynamic Diodes-Optoelectronics Test Platform for nuclear fusion experiments

Department
Mechanical Engineering

Project Participants
Melissa Matthes, Chris Hoolihan and Mike Regano

Instructor	Faculty Advisor	Tech. Advisors
Dr. Zhiyong Wang	Dr. Ke-Xun Sun	Terrance Kell and Jeff Markle

Problem Identified

Fusion power is earth's ultimate energy solution and the United States' nuclear stockpile is the foundation of our national security. Robust instruments and their calibration are essential for an understanding of both fusion energy and subcritical nuclear experiments.

Current Solutions

Thus far, most diagnostic instrumentation is carried out manually. This has become a hindrance for more frequent experiments at National Ignition Facility (NIF) at Lawrence Livermore National Lab. Specifically, our team is studying Gallium Nitride diodes, a new material for instrumentation, that have been irradiated NIF. Currently it takes an experienced technician three weeks to characterize these diodes. This project is targeted to automate this lengthy process, thus shorten the characterization time by a factor of 100 and enhance the precision and repeatability by a factor of 10.

Team's Solution

The project includes extensive mechanical design, analysis and fabrication with many interactions with the customers (scientific and engineering staff) to obtain an accurate testing device. Fundamentally, the team has created a robotic optoelectronics test platform for nuclear fusion experimentation that takes nine various tests for the characterization of Gallium Nitride diodes. The design utilizes motorized micrometers in x, y and z-axis that moves the diode chip to conduct the characterization accurately with high repeatability. The team's design involves rigid optomechanical mounts and combinations of rotational and linear mechanical guides to assure the measurement precision to be better than 5 micrometers. This is more accurate than what is currently being used. Furthermore, the team composed a LabView program for motion control, which will seek highest peak response position, further enhancing the test precision and accuracy of diode characterization.

This platform allows scientists to gather data from experiments in a more precise and efficient way that has never been done before. The inclusion of this robotic test-platform will become a small piece in the development of engineering solutions for fusion energy. The day of commercialization of fusion energy will be a major breakthrough. The advancement of this ground breaking research will provide an unlimited amount of electrical power to the globe in a cleaner and more ethical process eliminating the use of fossil fuels.

AdjusTABLE

Department
Mechanical Engineering.

Project Participants
Arvi Balbin, Lakiesha Hampton and Jericha Mendoza

Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. Brendan O'Toole

Problem Identified

During an eight hour work day, the average "desk job" employee is said to spend about 71% of their work day stationary at their desk. Most employees, such as professors, leave work with full body discomfort and pain due to the strain placed on the neck, back, arms and shoulders from sitting improperly throughout the day. Studies have shown that improper and prolonged use of desk equipment have been known to cause Musculoskeletal Disorders (or MSD's), negatively affect mental health, play a role in cardiovascular events, and could lead to cancer. It has been proven that in order to improve the strain that is caused by being hunched over at one's desk; a person's position should be altered every 20 to 40 minutes.

Current Solutions

Currently, most workplaces do not offer adjustable workstations because of the high cost and contemporary age of the market. There are several ergonomic adjustable desks in the market that include a table top (with little to no incorporated storage space) with the feature of either automatically or manually adjusting the height of the desk. These desk prices range from $800 to $4,000.

Team's Solution

The AdjusTABLE serves as a fully functioning kit that gives the user the tools necessary for a healthier work lifestyle, enabling them to switch from a sitting position to a standing position throughout the work day. The AdjusTABLE kit comes fully equipped with two lifting plates, mounting brackets, and sensor control box. Unlike other adjustable workstations in the market, the AdjusTABLE kit provides the user the alternative of transforming his or her existing desk into an adjustable desk instead of purchasing a brand new desk. Also, the lifting plates include additional storage space as well as an alert system that notifies the user to change the height of the desk. Workers who spend the majority of their work day sitting can benefit from the AdjusTABLE kit by improving their health, posture and overall well being through the switching of positions.

Hybrid Quadcopter

Department
Mechanical Engineering

Project Participants
Raja Palaparty and Yavor Mihaylov

Instructor	Faculty Advisor	Tech. Advisor
Dr. John Wang	Dr. Yi-Tung Chen	Dr. Woosoon Yim

Problem Identified
Quadcopters can be improved upon with regard to the increasing payload capacity and increasing flight time while minimizing the cost.

Current Solutions
The current high end quadcopter designs offer a payload capacity, which ranges from 0.5 to 3 lbs with flight times that range from 5 to 15 minutes sold at prices ranging from $1,200 to $10,000 dollars. A quadcopter, which is also known as a quadrotor helicopter, is a helicopter that has four rotors that generate the lift. Compared to helicopters, the quadcopter has two propellers spinning clockwise and two propellers spinning counter-clockwise, but all four propellers have the same pitch. In order to maneuver the quadcopter, the RPM of one or more motors is varied to change lift and torque.

Team's Solution
The solution is to make a long range UAV capable of flight times greater than 20 minutes while carrying a minimum payload of 3 lbs. This will be accomplished by utilizing a free-spinning gyrocopter propeller with a diameter of 32 inches using the Boeing-Vertol VR-7 airfoil. The lift provided by this gyrocopter rotor theoretically allows the controller to reduce the speeds of the four lift propeller thereby reducing energy consumption and increasing efficiency. The final design consists of 5 propellers; four for takeoff and control and the mentioned gyrocopter propeller providing a lift of 13 Newtons. The chosen material for the gyrocopter propeller is 3-D printed ABS plastic which gives a total weight of approximately 850 grams, providing a net lift of 475 grams and allowing the quadcopter to glide due to autorotation. The selection of a carbon fiber frame, lightweight motor, required propellers and battery adheres to total load and power consumption constraints while keeping the total cost under $850. This long range quadcopter can benefit any industry or person needing its capabilities which include hobbyists, rescue and police operations, surveillance and delivery.

Wireless, Damper-Fed Air Delivery System

Department
Mechanical Engineering

Project Participants
Michael Pickrell, Niaz Beheshti and Samuel Munoz

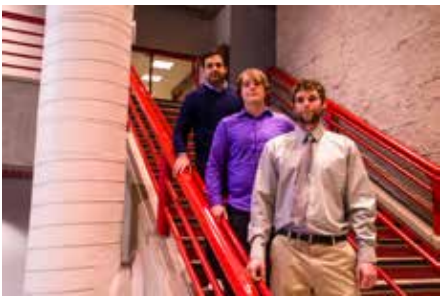
Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. Samir Moujaes

Problem Identified
The HVAC industry is constantly optimizing and improving upon the efficiency of past designs. Focus is typically placed on reducing pressure drops, decreasing power consumption and improving control methods. Our design will improve upon current control methods and reduce pressure loss during delivery in order to reduce overall power consumptions.

Current Solutions
Current techniques for air delivery are CAV (Constant Air Volume) and VAV (Variable Air Volume). CAV lacks any fine control over the air delivered to each zone in the air conditioning loop. In contrast, VAV units provide a modicum of control over the flow. However, they still produce large drops in pressure and cannot provide unique flow to each zone.

Team's Solution
Our design resolves issues in both pressure drop and controls. First, we remove the boxy VAV unit and attach individual opposed blade dampers to each delivery branch. By doing so we greatly reduce pressure drop during delivery. This increases efficiency by reducing the power required by the Air Handling Unit fan. Secondly, we introduce zone unique thermostats that independently control each damper. This reduces the chance of over or under-cooling each zone by appropriately adjusting each damper in relation to the flow required to reach a specified temperature in each zone.



Structural Teflon Microthrusters

Department
Mechanical Engineering

Project Participants
Alex Clinton, Alejandra Macias and Abelardo Villa

Instructor
Dr. Zhiyong Wang

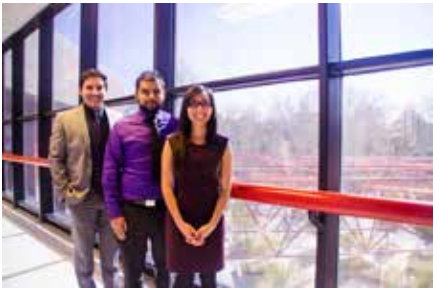
Faculty Advisor
Dr. Yi-Tung Chen

Tech. Advisor
Dr. Ke-Xun Sun

Problem Identified
Most microsatellites sent into orbit have no propulsion capabilities. There is a need for an inexpensive way to incorporate propulsion, without greatly sacrificing on-board space or power, in order to expand the range of research possibilities currently feasible.

Current Solutions
Current solutions include chemical and cold-gas propulsion designs; however, these require relatively high power, add unwanted weight to the satellite, and have been known to be explosive in some cases. Other Teflon-fueled pulsed plasma thruster configurations exist, but take up too much space of the volume constrained CubeSat systems because they are attached to the outside of the satellite.

Team's Solution
Our proposed solution is integrating Teflon-fueled pulsed plasma microthrusters into the structure of a CubeSat. This reduces the space taken up by the thruster outside of the satellite and simultaneously provides it with structural support. This arrangement allows the microsatellite to maintain its low weight, and is safe and relatively inexpensive, both in cost and power requirements. Facilitating the ability of CubeSats to fly in formation is a prime motivator for this project. However, other research areas, including weather and exploration, would also benefit from the ability for microsatellite propulsion control, which would allow data collection that is not currently acquirable. Additionally, our configuration could conceivably be applied to larger scale space vehicles and satellites in the future, possibly providing them an effective and economical alternative to their current propulsion methods.



DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Department Chair
Dr. Peter Stubberud

Senior Design Instructor
Brandon Blackstone

Smart Directional Control of Vehicle AC Vents

Department
Electrical and Computer Engineering

Project Participants
Elizabeth Baldivias and Jose Camacho

Instructor
Brandon Blackstone

Faculty Advisor
Venkatesan Muthukumar

Problem Identified

Drivers have to manually adjust vehicle air conditioning vents as well as the different levels of air being circulated in the vehicle. We want to give drivers and their passengers an extra level of comfort that will be marketable for car vendors today. As technology in vehicles continues to advance, air conditioning systems have stayed the same since they first offered factory-installed air conditioning in the 1940's.

Current Solutions

Our motivation came from living in the Las Vegas heat. Modern vehicles do not have motorized air conditioning vents. Vehicles have air conditioning vents that a person has to adjust manually to be directed toward a specific direction. The levels of air conditioning are completely controlled by the driver.

Team's Solution

Motorizing the aim of vehicle air conditioning vents will allow a multitude of benefits when paired with humidity and temperature sensors as well as a central control. The proposed system will automatically direct vents to the faces of the driver and the passenger, or just the driver if no passenger is present. The vents will be controlled by the distance sensor, which will determine how tall the person is and enable the system to know where to direct the vent. The system will sense the temperature of the car controlled by the temperature sensor that communicates with the blower. As the temperature drops the blower will gradually decrease how much air is released. If the driver wants to have more control of the system they will be able to disable the system and have touch screen control of the positioning of the vents and the amount of air that will be delivered through the vehicle. Our design will benefit the automotive industry as a whole; not only for consumers, but also for manufacturers. Drivers will have an added comfort along with making the most out of their fuel efficiency, while manufacturers will have an additional selling point to provide to their consumers.

Operation Toybox

Department
Electrical and Computer Engineering

Project Participants
Ashim Ghimire, Ian Yanga, Matthew Parker and Justin Swinney

Instructor
Grzegorz Chmaj

Faculty Advisor
Venki Muthukumar

Problem Identified
The autonomous object-finding robot is a robot that is able to identify, locate, and pickup objects without any human interaction. In this specific application, the robot is set to identify toys in a child's room and put them into a toy box. The purpose of the robot is to automate the task of a parent cleaning their child's room.

Current Solutions
Robots that exists in the market are assigned to do various mundane tasks that require simple sensors to detect things around them allowing them to for example clean a window/carpet floor, provide entertainment, etc. The current solutions simply rely on sensors like mentioned above to detect their surroundings to accomplish the task assigned to them.

Team's Solution
The robot will be programmed to find a toy, pick it up, and put it away, and then repeat the process. To do so it uses a camera, a single-board computer along with computer vision software to identify toys and control movement. The current solutions don't have the capabilities of high-tech image manipulation, spacial detection, shape identification, and other technology to adapt to the environment around them and that's what we aim to accomplish. Our solution will also adapt easily to be able to recognize new objects as new toys are purchased. Parents can easily register the new toy which will allow the robot to detect it if located on the ground. This project will greatly benefit parents who don't a lot of time during the day to keep up after their children after a long day at work which will relieve stress for the family and prevent any dangers that may occur from accidentally falling/slipping on objects on the ground. Our solution will also be good for daycare centers where there are a lot of children in one area and toys have gone amuck and need to be put away.

Optogenetic Stimulator

Department
Electrical and Computer Engineering

Project Participants
Henry Chan, Mario Valles and Michael Villalba

Instructor
Brandon Blackstone

Faculty Advisor
Dr. Ke-Xun Sun and Dr. Yingtao Jiang

Problem Identified

In the field of medicine and biology, there currently exists the possibility to explore the role of light in the modulation, maintenance and improvement of biological cell function. Optogenetics is a new and exciting area of scientific research that combines optics and genetics in an attempt to stimulate photosensitized neurons in the brain. Due to the relatively new development of the field, hardware tools for facilitating research in optogenetics are scarce and extremely expensive. Our goal is to provide a stimulation tool that can deliver precision, reliability, and flexibility at a relatively cheaper price.

Current Solutions

Very few companies provide the hardware tools to make optogenetic research possible. Existing hardware tools intended for optogenetics are only available at extremely high prices. Current competing solutions can cost hundreds of dollars for individual components and thousands of dollars for complete systems. The high price coupled with scarcity forces many researchers without engineering backgrounds to develop their own tools, resulting in low-quality designs with imprecise outputs.

Team's Solution

Our solution will provide an inexpensive alternative to the current market solutions and prevent the proliferation of inferior hardware tools developed by non-engineering individuals. Many scientists, researchers, and medical professionals will benefit from the availability of lower-cost equipment and improved precision for optogenetic research. We strive to provide the reliability, flexibility and precision of a high quality light stimulation device capable of modulating output power and pulse frequency at a lower price point. With precision spatial control, the illumination of specific tissues and nerves in a targeted area will be exceptionally convenient. Pulse frequency modulation will allow extreme temporal precision to synchronize light stimulus with biological rhythms. Using our device will give researchers ample opportunity to explore the vast role of light in biological systems with an unprecedented amount of control and flexibility.

Autonomous Security Rover (ASR)

Department
Electrical and Computer Engineering

Project Participants
Brian Kieatiwong, Tony Teoh and Rong Xue

Instructor
Brandon Blackstone

Faculty Advisor
Dr. Jacob Baker

Problem Identified
Employing a human security guard at all times is not practical. Problems include cost, training and manpower.

Current Solutions
One prominent solution available on the market is the Knightscope K5. This autonomous robot acts as an aid to law enforcement and security. This system has a vast array of sensors, including GPS capabilities for obstacle avoidance and autonomous travel.

Team's Solution
Our solution has many hallmarks of current solutions.Though we will be employing fewer sensors to avoid obstacles and travel to a designated position, we will be using localized tracking. This will give the rover a more accurate position than GPS, because GPS is accurate only up to a few meters. With localized tracking, there would not be a need for any preloaded map. Another advantage with localized tracking is that it will not require a constant Wi-Fi connection to reach its destination. Once the rover receives coordinates, it will travel autonomously to that position even if communication through Wi-Fi is lost or cut off. Our solution will also be cheaper and more independent than the current solution.

Compressive Sensing Stockings

Department
Electrical and Computer Engineering

Project Participants
Dano McKay and Oliver Musovski

Instructor
Brandon Blackstone

Faculty Advisor
Dr. Jacob Baker

Problem Identified
Venous stasis is a condition of slow blood flow through the veins which forms blood clots. These blood clots then produce ulcers, which cause swelling and discoloration. To treat these ulcers typically some sort of pressure is applied to compress the superficial veins. The most common way to apply this pressure is through a compression stocking.

Current Solutions
There are two types of solutions currently on the market. Pneumatic devices are too bulky and are not mobile. Elastic devices allow the patient to be mobile, but they stretch out over time and the patient is unaware of the change. Both of these solutions do not have high patient compliance.

Team's Solution
Our design is in an effort to increase patient compliance by providing them an easy to use and informative compression stocking design. While wearing the stocking the patient wraps an ACE bandage over it and reads the compression levels via Bluetooth on their smartphone device. Using this method will accurately inform the patient if they are wrapping their leg to the appropriate pressure. The sensors are thin and allow for a mobile version of current market solutions. The interaction with a smartphone app also allows patients to get more involved in checking their health. Making our solutions simple and interactive will lead to greater patient compliance and better treatment overall.

High Powered EM Radiation Meter/ Warning System

Department
Electrical and Computer Engineering

Project Participants
Jeevake Attapattu, Richard Romero and Aaron Romulo

Instructor
Brandon Blackstone

Faculty Advisor
Dr. Shahram Latifi

Tech. Advisor
Carlos Comacho and Dr. Robert Schill

Problem Identified
High powered electromagnetic signals have the potential to cause harm to humans. Strong electromagnetic signals can cause heating to tissue and interfere with electronic implants.

Current Solutions
The electromagnetic meters that have been seen so far are mostly used for recreation. Some have been specifically advertised for use as ghost hunting equipment. Others, provide limited information about the signal. In addition, the more sensitive instruments are designed for a narrow frequency range and provide no frequency information.

Team's Solution
Our solution uses a log periodic antenna to capture the signal, a radio frequency circuit board to process the signal and a tablet to analyze and display the signal. The result is a portable signal analyzer that works over a 300 MHz to 6 GHz range. We can see the entire spectrum in this range with a breakdown of the power and frequency of the signal. Additionally, we use Ubuntu for an operating system and GNU Radio for our software interface. The open source nature allows for end user customization. Our setup can be used by anyone concerned about the emissions from radio, cellular and radar antennas etc. It would be specifically useful to technicians working with systems that output high powered electromagnetic signals.

Compact Integrated Processor

Department
Electrical and Computer Engineering

Project Participants
Jared Hayes, Nick Repetti and Jason Silic

Instructor
Brandon Blackstone

Faculty Advisor
Dr. Jacob Baker

Problem Identified
University students and engineers often prefer to learn initially from simple designs. After they have gained experience they will undertake more complicated projects. It is difficult to find these “simple” computer chips with fully documented hardware today. The most basic embedded processors are not easily understood by even senior engineering students.

Current Solutions
In the current processor market, proprietary and advanced designs compose the majority of the market. In addition, these chips are often very small and hard to use without specialized and expensive robotic equipment. Most of them do not document the actual circuits used for their internal logic, preventing detailed understanding of the processor.

Team’s Solution
Our chip has a simple and straightforward architecture to aid in comprehension of the hardware. The internal circuitry is documented from the transistor level so that students can study how it works. The on die SRAM makes the external circuitry needed to run this chip very minimal, facilitating rapid prototyping. Fabrication is within the reach of even small businesses because our processor is designed for an older process node. A large physical package is particularly attractive for designers without advanced soldering equipment. This design may fill only a small niche, but its focused design ensures maximum utility within these parameters.

Dynamic Electric Heater for Hookahs

Department
Electrical and Computer Engineering

Project Participants
Brian Smith and Michael Kao

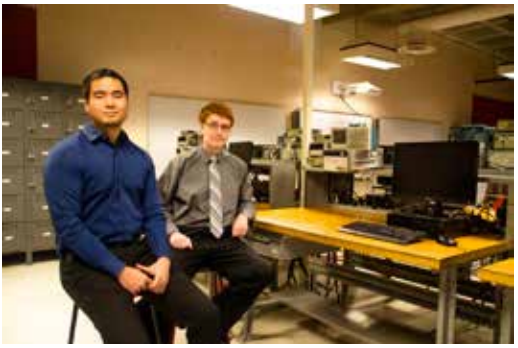
Instructor
Brandon Blackstone

Faculty Advisor
Dr. Yahia Baghzouz

Problem Identified
Traditional hookah bowls use loose charcoal as a heat source. The smoke from them is inhaled adding an additional health risk and the unsecured coals are a fire hazard.

Current Solutions
There are other electric bowls, however they are simple hot-plates that need to be manually adjusted.

Team's Solution
Our solution uses proportional-integral-derivative controller (PID controller) to keep the device at an accurate temperature and respond similarly to traditional charcoal. The heater is secured to the bowl, which is safer. This solution is also less expensive in the long run because of eliminating recurring charcoal purchases. It is for users of traditional hookah bowls.



Spring 2015 Senior Design Competition Notes

UNLV President's Cabinet

President
Len Jessup

Executive Vice President and Provost
John Valery White

Senior Vice President for Finance and Business
Gerry Bomotti

Vice President for Advancement
William G. Boldt

Vice President for Student Affairs
Juanita Fain

Interim Vice President for Research and Economic Development
Thomas C. Piechota

Director of Athletics
Tina Kunzer-Murphy

Senior Advisor to the President
Nancy B. Rapoport

General Counsel
Elda Luna Sidhu

Chief of Staff
Fred Tredup

Vice President for Diversity Initiatives and Government Affairs
Luis Valera

Howard R. Hughes College of Engineering Advisory Board

Dominic A. Marrocco, Chair
Michael Mohar, Vice Chair
Jim Barbee
Selma Bartlett
Jody Walker Belsick
David Bonnesar
Jack Brannan
Jay Chmelauskas
Shawn Danoski
Ralph Decker
Judi A. Dohn
Dr. Bob Drubka
Raul Flores
Jeff George
Adam Godorov
Bruce Graff
Jonathan Grantham
Christopher Grenz
Tony HIlls, P.E.
Alan Hunter
Randy Innis
Greg O. Korte
Michael Maier
Joe Marcella
Clark G. McCarrell
David McElwain
Doa M. Meaded
Jason Mendenhall
Chad Miller, Esq.
Mark Newburn
Srini Raghavan
Charles Scott
Raquel Speers Shohet
Rick R. Stater
Troy E. Wade
Heather Wilde
Zane Wilson
Eugene Wong
Ali Yari

Howard. R Hughes College of Engineering Leadership

Rama Venkat, Dean

Mohammed Trabia, Associate Dean of Research, Graduate Programs and Computing

Georg Mauer, Associate Dean, Undergraduate Programs

Laxmi Gewali, Chair of Computer Science Department

Donald Hayes, Chair of Civil and Environmental Engineering and Construction Department

Brendan O'Toole, Chair of Mechanical Engineering Department

Peter Stubberud, Chair of Electrical and Computer Engineering Department

UNLV appreciates the leadership and support of our Nevada System of Higher Education Board of Regents.

Kevin J. Page, Chair

Rick Trachok, Vice Chair

Dr. Andrea Anderson

Cedric Crear

Mark W. Doubrava, M.D.

Jason Geddes, Ph.D.

Trevor Hayes

Sam Lieberman

James Dean Leavitt

Kevin C. Melcher

Allison Stephens

Michael B. Wixom

Scott Young, Acting Chief of Staff to the Board

Dedicated to the Memory of:

Fred Cox

Innovator, Entrepreneur, Supporter, Advocate, Role Model and Mentor

(June 3, 1934 to August 21, 2014)

"Fred had a commitment to hands-on education, to improving engineering programs each day and to ensuring that our students create the products and businesses of the future. His passionate input and dedication will be missed."

—Rama Venkat, Dean of the Howard R. Hughes College of Engineering