Friday, May 8, 2015, 1 - 5 p.m.
USU Northridge Center and Grand Salon
Greetings,

On behalf of our students and faculty, I would like to invite you to attend our sixth annual 2015 Senior Design Project Showcase event from 1:00 p.m. – 5:00 p.m. on May 8, 2015 in the USU Northridge Center and Grand Salon at California State University, Northridge. This year’s SDPS features senior design projects from all the undergraduate programs in our college. Also, breakout sessions (oral presentations) have been planned where the top teams from each program as selected by the department/program have been invited to compete for prizes. As in past years, the projects will be judged by a distinguished panel of industry experts. You can find detailed information about the event on the web at www.ecs.csun.edu/ecs/sdps. It has been exciting to watch this event grow and expand over the years and is a testament to our hardworking students who are ably guided by our faculty and our supporters from industry.

By way of background, the College of Engineering and Computer Science is home now to almost 4,500 students and 68 full time faculty members, with active searches to fill eleven new faculty positions this fall. We offer ABET accredited undergraduate programs in Civil Engineering, Computer Science, Electrical Engineering, Computer Engineering, Manufacturing Systems Engineering and Mechanical Engineering. Our Construction Management program is accredited by the American Council for Construction Education. We also offer several contemporary Master’s Degree programs that are designed to meet emerging workforce needs. The college graduates approximately 600 students annually from these programs. Our students continue to garner accolades and recognition for their accomplishments at regional and national competitions and remain a shining testament to the “CSUN SHINE” vision articulated by our President Dr. Dianne Harrison. Graduates from the college’s programs serve in leadership positions in industry, government and academia.

This past year has been especially eventful as the College’s AIMS² program funded by the US Department of Education received national recognition from Excelencia in Education for its efforts to bolster student success and support underrepresented minorities in engineering and computer science. In October 2014 CSUN was selected to host one of the four national White House STEM workshops that focused on removing barriers and improving student success in STEM disciplines. Support for the workshop was provided by the Leona M. and Harry B. Helmsley Trust and the White House Office of Science and Technology. And we are building up to a crescendo with SDPS 2015! Don’t miss this opportunity to see and hear firsthand from our outstanding students and soon to be graduates. I am sure you will be impressed with the diversity and quality of our student projects and look forward to seeing you on May 8th.

Sincerely,

S. K. Ramesh, Ph.D.
Dean
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Program
Friday, May 8, 2015

Display of Projects
[Projects in the process of being judged will not be available for display]
1:00 - 5:00 p.m.

Northridge Center, University Student Union
Civil Engineering & Construction Management
Manufacturing Systems Engineering & Management
Mechanical Engineering

Grand Salon, University Student Union
Computer Science
Electrical & Computer Engineering

Oral Presentations
(see page 10 for specific times for each project)

Civil Engineering & Construction Management
1:00 - 3:40 p.m.
USU Tujunga Room, East Conference Center

Computer Science
1:00 - 2:50 p.m.
USU La Crescenta Room, East Conference Center

Electrical & Computer Engineering
1:00 - 2:10 p.m.
USU Thousand Oaks Room, Southwest Addition, Second Floor

Manufacturing Systems Engineering & Management
1:00 - 2:10 p.m.
USU Van Nuys Room, East Conference Center

Mechanical Engineering
1:00 - 3:15 p.m.
USU Panorama Room, East Conference Center

Announcement of Awards
5:30 p.m.

Please see University Student Union (USU) map on page 10 for room locations.
Directions and parking information are on page 26.
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Region Manager
DC&M North Coast
Southern California Edison

J. F. (JACK) BUHN
President & CEO
Canoga Perkins

VAUGHN CABLE (IAB CHAIR)
Spacecraft Communications Systems & Operations Group
Jet Propulsion Laboratory
California Institute of Technology

RORY DEJOHN
Senior Vice President
Turner Construction Company

CHRISTOPHER M. ERICKSON
Chief Engineer
Energy & Advanced Programs
Aerojet Rocketdyne

NEAL GABORNO
Program Chief Engineer
SAS Systems Verification Center
Raytheon Company

MILAD GIRGIS
Vice President Neuromodulation,
International Sales, Deep Brain Stimulation
& Program Management
Boston Scientific Neuromodulation

RONALD HARDGROVE III
NH-04, Department of the Air Force Sensors Flight Test Expert
Edwards Air Force Base

BALAJI IYER
Associate Director
Airborne Electronic Attack Division
Naval Air Warfare Center Point Mugu

GARY MALLALEY
Program Director
LN-25x Fiber Optic Gyro Programs
Northrop Grumman Corporation
Navigation Systems

NICK MANSUR
Vice President Engineering
AeroVironment

MICHAEL C. McALPINE
Vice President, Project Executive, CM
Construction Management Division – Western Territory
STV, Inc.

CAROLE MORTON
President
Salt Interprises

PEGGY NELSON
Vice President of Engineering and Global Product Development
Northrop Grumman Corporation
Aerospace Systems Sector

NAOMI PALMER
Section Manager
Power and Sensor Systems
Jet Propulsion Laboratory

FELIX RABINOVICH
Director, Product Development
ATIMS

A. F. (RICK) RATCLIFFE
Dean Emeritus
College of Engineering & Computer Science
California State University, Northridge

DUTCH SCHULTZ
General Manager - West
KCI Technologies

PERRY SOLOMON
President & CEO
Aleratec, Inc.

CHARLES VOLK
Vice President and Chief Technologist
Northrop Grumman Corporation
Navigation Systems

MARILEE WHEATON
General Manager
Systems Engineering Division
The Aerospace Corporation
Sponsors

We appreciate your support!
Thank you Project Showcase Judges!

Faculty Moderators

Rais Ahmad
Civil Engineering & Construction Management

Jimmy Gandhi
Manufacturing Systems Engineering & Management

Ruting Jia
Electrical & Computer Engineering

Vahag Minassian
Project Manufacturing Engineer
Northrop Grumman Corporation
Manufacturing Systems Engineering & Management Liaison Council

Lief Morin
President
Key Info

Naomi Palmer
Section Manager
Power and Sensor Systems
Jet Propulsion Lab (JPL)
College Industry Advisory Board

Felix Rabinovich
Director, Product Development
ATIMS
College Industry Advisory Board

Amin Rashidian
Electrical Engineer
Aerovironment, Inc
Electrical and Computer Engineering Liaison Council

BJ Schramm
President and COO
Roberts Tool Company, Inc.
Manufacturing Systems Engineering & Management Liaison Council

Todd Uramoto
Manager, Engineering Operations
Northrop Grumman Electronic Systems

Charles Volk
Vice President and Chief Technologist
Northrop Grumman Navigation Systems
College Industry Advisory Board

John Wright
Hartzell Aerospace
Schedule

Civil Engineering and Construction Management [USU Tujunga Room, East Conference Center]
- 1:00 - 1:20 p.m. Concrete Canoe
- 1:25 - 1:45 p.m. BLVD 6200
- 1:50 - 2:10 p.m. Expanding a Medical Facility in Haiti to Meet the Community’s Growing Demand
- 2:30 - 2:50 p.m. Towards a Splendid City
- 2:55 - 3:15 p.m. Economical Bridge Design for Impoverished Area
- 3:20 - 3:40 p.m. Mariposa Land Port of Entry in Nogales, Arizona

Computer Science [USU La Crescenta Room, East Conference Center]
- 1:00 - 1:20 p.m. Jail Management Single Page Application (JMSPA)
- 1:25 - 1:45 p.m. Lightning3D Game Engine
- 1:50 - 2:10 p.m. Network of Electronic Self-Navigating Transports (NEST)
- 2:30 - 2:50 p.m. Lights Out!

Electrical and Computer Engineering [USU Thousand Oaks Room, Southwest Addition, Second Floor]
- 1:00 - 1:20 p.m. Autonomous Unmanned Aerial Vehicle
- 1:25 - 1:45 p.m. Micromouse Project
- 1:50 - 2:10 p.m. Digital Storage Scope

Manufacturing Systems Engineering & Management [USU Van Nuys Room, East Conference Center]
- 1:00 - 1:20 p.m. Delivery Hexacopter
- 1:25 - 1:45 p.m. Dynamical Lug Wrench
- 1:50 - 2:10 p.m. Hybrid Layer Manufacturing 3D Printer

Mechanical Engineering [USU Panorama Room, East Conference Center]
- 1:00 - 1:20 p.m. Intelligent Ground Vehicle
- 1:25 - 1:45 p.m. Solar and Wind Powered Sea Water Desalinator
- 1:50 - 2:10 p.m. SAE Aero Design Heavy Lift Aircraft
- 2:30 - 2:50 p.m. Human Powered Vehicle Challenge
- 2:55 - 3:15 p.m. Formula SAE Car Project
Senior Design Projects
Towards a Splendid City

Project Description: This group of projects started out as simple exercises to get undergraduate civil engineering students acquainted with wood design and construction in seismically active areas on the West Coast. The single family dwellings (SFD) and multi-family dwellings (MFD) are proposed within Los Angeles County.

From an architectural point of view, the two-story SFD’s include living area, kitchen, dining area, bedrooms and bathrooms, as well as green measures (roof garden and solar systems that generate electricity and heat). In addition, the three-story MFD includes living area, kitchen, dining area, bedrooms and bathrooms, as well as green measures (roof garden and solar systems that generate electricity and heat). These architectural features allow for a structural design that is a balloon frame system utilizing available wood sizes and taking advantage of the bearing perimeter walls.

These living spaces serve as possible examples of future residences that graduating students may engage with in their structural design vocations.

Expanding a Medical Facility in Haiti to Meet the Community’s Growing Demand

Project Description: This project represents a continuum between last year’s work and an approach that Civil Engineering Seniors at CSUN are using to assist a humanitarian organization. ‘Helping Hands and Beyond, Inc.’ (a nonprofit group) promotes wellness at Fonds des Nègres (a rural Haitian community). Last year, the organization approached CSUN’s Civil Engineering and Construction Management (CECM) Department to help designing a medical facility for the constituents it serves in Haiti. CECM delivered architectural and structural services for the facility. The designed facility comprised a large waiting area, medical examination rooms, a dental care room, psychotherapy evaluation room, a pharmacy and a laboratory area.

After a practicing medical professional critiqued the design, and along with other needs (such as reliance on low technology, constant population growth and limited number of medical practitioners in the community), CECM decided on an expansion plan that follows an evolutionary pattern. This pattern involves analysis, modeling and interpretation, allowing students to create a generative design that meets current demand and one that grows continuously.
Concrete Canoe

**Project Description:** Each year, the American Society of Civil Engineers (ASCE) challenges students to design, construct, and race a canoe cast entirely using lightweight concrete.

Using ASCE regulations, the competition allows students to develop their engineering skills further. This includes discovery, problem identification, solution plans, implementation, analysis and interpretation. Working together, the team is able to analyze and develop an efficient canoe design that can be used to build a product that can withstand hydrodynamic forces, one that is stable and can propel across coastal waters.

Economical Bridge Design for Impoverished Area

**Project Description:** The American Society of Civil Engineers (ASCE) and the American Institute of Steel Construction (AISC) challenge and sponsor civil engineering students nationally to design, fabricate and construct a structural steel bridge, on an annual basis.

The ASCE CSUN Steel Bridge team was tasked with designing and constructing of an economical bridge which will allow for commerce between impoverished farming villages and the capital of a fictional country. In order to prove the feasibility of design, we were asked to construct a 1:10 scale model to demonstrate the concept. Unique challenges for this year include the inability to utilize temporary piers due to deep organic soil. In addition, low water levels during dry seasons do not allow for the use of barges.
Mariposa Land Port of Entry in Nogales, Arizona

Project Description: Upgrades to the Mariposa Land Port of Entry pedestrian and car border crossing.

BLVD 6200


Jail Management Single Page Application (JMSPA)

Project Description: In conjunction with Advanced Technology Information Management System (ATIMS), a company that provides law enforcement software to various agencies, the JMSPA will prototype various web application functions and features for future use in ATIMS’s proprietary jail management software application. The JMSPA is built upon a foundation of modern single-page web application technologies such as C#, Entity Framework, Amazon Web Services (AWS) and AngularJS.
**CodeEscape**

**Project Description:** The objective of this project is to create a first-person horror game which will assist players in learning the basics of Java. The potential customers for this product will be students who are taking an introductory course in Java and for those who are interested in learning the language. Normally, Java is learned through the classroom or through online guides. This product can be very useful to the customer, since it offers a different and fun manner in which to learn a programming language.

**Lightning3D Game Engine**

**Project Description:** Lightning3D is a lightweight, cross-platform 3D game engine. It is written in Java and uses OpenGL ES. The engine comes with support for Android and Windows platforms. It features mesh loading, physics/collision based on the bullet physics library, projectiles, networking, particle systems, procedurally generated levels, rendering, animation, textures, shading and lighting.

**Study Buddy**

**Project Description:** Study Buddy is a productivity tool suite which offers note taking, a to-do list, a calendar, and flashcards. Our goal is to help students achieve their full academic potential.

Study Buddy is designed for use with Android phones or tablets. Our core tool is a digital note taking system where students may type or handwrite notes. Users may also easily embed pictures, videos, and sound recordings take from their device within their notes. We offer a todo list to track tasks and a calendar for events. Finally, we have a flashcard system where users can create multiple decks of cards.
Network of Electronic Self-Navigating Transports (NEST)

**Project Description:** NEST is a system managing a large group of highly autonomous UAVs that are doing delivery in a small area. NEST will give the tools needed in order for a small group of human operators to manage a fleet of hundreds or thousands of UAVs, including manipulating the automation, monitoring tools that give the large amounts of data in an easy to view format, and controlling individual elements of the operations. NEST is also capable of communicating with a small quadrotor to send commands.

Lights Out!

**Project Description:** An Android/Android Wearable game that takes hand gestures with a focus to a user that are blind or deaf.
Micromouse Project

**Project Description:** Micromouse is an engineering design competition created by IEEE where small robotic mice solve a 16x16 maze. The mice are completely autonomous robots that must find their way from a predetermined starting position to the central area of the maze unaided. The mouse will need to keep track of where it is, discover walls as it explores, map out the maze and detect when it has reached the goal. Having reached the goal, the mouse will typically perform additional searches of the maze until it has found an optimal route from the start to the center.

Autonomous Unmanned Aerial Vehicle

**Project Description:** The objective of the project is to produce an aerial vehicle that is capable of autonomously navigating, avoiding obstacles and interacting with both other aerial vehicles and ground vehicles.
AM/FM Receiver

**Project Description:** Design a Receiver to pick up commercial band.

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Digital Storage Scope

**Project Description:** The digital storage scope is an external unit which attaches to the input terminals of an oscilloscope and that displays signals indefinitely. The input has two inputs which converts the input signal into digital signals capable of being stored. It is capable of displaying a 1 MHz square wave signal as a minimum and also displays all analog signals up to 1MHz. All three axes \(x, y, z\) are controlled by the external unit. Delayed sweep and pretriggering are provided.

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WWVB Receiver

**Project Description:** The WWVB station near Fort Collins, Colorado broadcasts a 60kHz signal which transmits the national time (UTC) and other information over a period of one minute. The receiver decodes this signal and then displays the transmitted time on an LCD board, exactly like a radio controlled clock that syncs every night.
Delivery Hexacopter

**Project Description:** This project proposed to make a Hexacopter to deliver documents by adding a safe box with fingerprint or pin code access.

![Hexacopter Image]

Dynamical Lug Wrench

**Project Description:** The dynamical lug wrench is a multi-nuts remover that can simultaneously remove all tire bolts at once. It offers a simple and stress-free system to change tires since a person only uses a single lug wrench to remove all bolts. Moreover, the product is unique compared to the standard lug wrench, enabling faster and simpler method of changing tires. The dynamical wrench will guarantee safety since it can change flat tires in a fast and modest method.

![Lug Wrench Image]

Hybrid Layer Manufacturing 3D Printer

**Project Description:** The HLM3D seeks to combine the best features of both processes in one machine to create objects that are unique to Hybrid Layer Manufacturing, high quality, require little training in machining, reduce the amount of waste material, and reduce cost of creating high quality objects.

![3D Printer Image]
Human Powered Vehicle Project

**Project Description:** The Human Powered Vehicle Challenge (HPVC) is an annual competition sponsored by The American Society of Mechanical Engineers (ASME). It provides an opportunity for undergraduate Mechanical Engineering students to develop, design, analyze, build, test, validate and finally compete with their own sustainable and practical vehicle.

This Senior Design Project is organized into four main teams. The Systems team is a new addition this year and conducts System Engineering tasks and is ultimately responsible for the performance of the vehicle and ensuring that requirements and rules are closely followed by other teams. The Frame Team designs, analyzes, and builds the frame for the vehicle. This year’s frame will be constructed from Aluminum 6061-T6 and completely machined and welded in-house by HPV team members. The Fairing team’s goal is to reduce the weight by about 25%. An open Carbon Fiber fairing is being utilized which will provide sufficient ground clearance, while making it easy for the riders to enter and exit the vehicle in a timely fashion. Finally, the components team optimizes such subsystems as steering, breaking, and drive systems.

CSUN’s students will compete in the Human Powered Vehicle Challenge at San Jose, California on April 24-26, 2015 against engineering schools from all over the world in such events as: Design, Speed, Endurance and Innovation.

Intelligent Ground Vehicle

**Project Description:** The Intelligent Ground Vehicle project is a project based on navigating a fully autonomous robot through a course filled with obstacles designed to obstruct our path to waypoints that must be achieved. The robot used to navigate this course is a robot designed by the team that features a standard suspension and a low-profile design, perfect for the high maneuverability necessary to complete the course. The robot uses a GPS and compass for navigation purposes, along with three laser range finders, and two cameras, which are all used for obstacle avoidance.
Mechanical Engineering

**FACULTY ADVISOR**

Dr. Abhijit Mukherjee

**TEAM MEMBERS**

Saleh Aldakheel
Abdulaziz Aldewaikh
Franck Ndedi Balemagna
Benjamin Cheraitia
Ryan Crane (Captain)
Garo Dadarian
Victor Farodolu
Sekak Galstyan
Meng Han
David Hernandez
Seth Hurd
Travis Jack
Kyle Lofgren
Daniel Medina
Mallory Murr
Laura Sacco
Anthony Scarcello
Hovhanness Shadanyan
Arbi Shahmirzaian
Christopher Silva
Daniel Wegeshe

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**SAE Aero Design Heavy Lift Aircraft**

**Project Description:** The Society of Automotive Engineers (SAE) Aero Design competition challenges students to design, manufacture, and fly a radio-controlled cargo aircraft on a mission to simulate a humanitarian aid cargo drop. The approach to this project taken by the CSUN Aero Team is to simulate a professional aerospace engineering firm. This requires students to apply a solid understanding of the technical skills they have gained throughout their education as well as practical skills and teamwork. The mission objective of this year’s competition is to design an aircraft that can drop a 3 lb humanitarian aid package onto a fixed ground target from at least 100 ft in the air. In addition to the mission requirements, there are variable constraints on the aircraft weight and the weight of static cargo the aircraft takes with it on the mission. In order to maximize the team’s mission score, we selected the strictest possible system weight requirements.

This project is the culminating experience of years of engineering education. The team’s goal is to win the competition while upholding world-class standards of engineering professionalism. Students took their design through the entire product development cycle: concept, design, analysis, manufacturing, testing, and operation. At the competition in Van Nuys, CA over the weekend of April 24th, the CSUN Aero Team will compete against universities from around the world in static events as well as mission performance.

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**FACULTY ADVISOR**

Dr. George Youssef

**TEAM MEMBERS**

Abdulrahman Abdulrahman
Titus Areeckal
Vladimir Arutyunov (Captain)
John Bastar
Luis Calderon
William Cault
James Connolly
Daniel Do
Khaled Erdaini
David Gaeta
Kevin Hudelson
Raymundo Jimenez
Allen Kasapian
Eric Kattan
Kelvin Konevsky
Naguib Said
Christopher Thompson
Kendra Todd
Aurora Varela
Ian Wilmoth
Paulo Yu

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**Solar and Wind Powered Sea Water Desalinator**

**Project Description:** Our team engineered a vertical-axis wind turbine. This project is a continuation of a 2014 Alternative Energy Team’s project. Vertical axis blades were chosen due to increased efficiency as opposed to typical horizontal axis windmills. The structure is made of stainless steel to increase stability and durability, and arms made of aluminum. When assembled, an alternator generates additional electrical energy to the batteries in CSUN’s HAAS Lab; these batteries currently store energy from a solar panel. Because the current solar panel creates more energy than is used in the lab, we designed and built a sea water desalination system to take advantage of the excess energy in the batteries.

Our renewable energy powered desalinator is designed to take advantage of the reverse osmosis membrane desalination technology. With an output of fresh water production capacity of almost 76 liters/day (20 GPD), the unit is designed to produce drinking water in compliance with standards established by the World Health Organization (W.H.O.).
Formula SAE Car Project

**Project Description:** Formula SAE is an annual competition held by SAE International, co-sponsored by a consortium of companies including General Motors, Ford, Chrysler and Honda. The concept of the competition is to create a fictional manufacturing firm that has appointed a design team, Matador Motorsports, to produce a prototype racecar. The target market is the non-professional autocross racer. Students are required to conceive, design, and build a formula style racecar to compete each year against other universities from around the world.

This capstone project requires the skills and theory learned from the mechanical engineering cornerstone classes. Two parts of the curriculum are emphasized: theoretical and applied aspects. Students work with state-of-the-art equipment that manufacture the components they have designed. This teaches them the benefits of simple practical designs and ease of manufacturing. Furthermore, the FSAE experience entails managing cost, fitting each individual’s design into the overall assembly, and testing the components.

The design and fabrication of the FSAE racecar takes place over a period of nine months and is used as a training ground for young engineering students in preparation for the immensely competitive engineering industry. Restrictions are placed on the design of the car in order to test the student’s ingenuity for maximizing the vehicles performance. This project develops essential skills used by engineering firms, from the design process to fabrication; each step of this project takes cost, ease of manufacturing, and vehicle performance into consideration. Once our racecar has been designed, manufactured, and tested, the team travels to the SAE competition in Lincoln, Nebraska to compete against engineering schools from all over the world in static and dynamic events.
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THE VALUE OF PERFORMANCE.

Thank You

We would like to thank our friends, industry advisory board members:

Jack Buhn
Balaji Iyer
Charles Volk

for their support for this year's Senior Design Project Showcase.
Congratulations Seniors!

Best Wishes,

Aleratec
www.aleratec.com
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Aerojet Rocketdyne is proud to support the 2015 Senior Design Project Showcase.

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All of us at Anheuser-Busch proudly support CSUN College of Engineering & Computer Science for leading the way.
Directions and Parking Information

College of Engineering & Computer Science
Senior Design Project Showcase

Parking Information

1. Purchase parking permit at Information Booth ($6/permit, cash only).

   You can also purchase a parking permit at a permit dispenser located at each level of the parking structure ($6 per permit, cash and credit cards are accepted).

2. Park in Lot G3.

3. Walk to the University Student Union (USU)