

Cal Poly Pomona College of Engineering

**Research Facilities, Laboratories,
Student Projects, & Faculty Expertise**



Research Facilities, Laboratories, Student Projects, & Faculty Expertise

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A Comprehensive Approach to Engineering is Vital for our Continued Success

The College of Engineering is dedicated to providing students with the highest quality education possible, while serving as an important resource to the region and beyond.

- The College of Engineering is committed to **maintaining the “Learn by Doing”** approach in engineering instruction.
- The College of Engineering is committed to **providing exceptional undergraduate educational opportunities** through proactive recruitment, retention and support services.
- The College of Engineering is committed to **promoting graduate programs** in order to enhance the College’s reputation, and meet the growing demand for students with advanced degrees.
- The College of Engineering is committed to **supporting research and scholarly activities** through external and internal grants, contracts and business partnerships with local and national organizations interested in leveraging the resources of the College.
- The College of Engineering is committed to **cultivating a strong sense of community**.

The College of Engineering at Cal Poly Pomona is one of the Best in the Nation

The College of Engineering at Cal Poly Pomona offers an engineering education with a strong theoretical background and significant hands-on laboratory experience in a diverse range of disciplines. Each year approximately 650 students graduate from the College of Engineering and are prepared immediately to enter the global workforce, to offer significant contributions to industry, and to pursue graduate studies. As the 17th largest engineering school in the nation, we have over 5,000 students in 11 undergraduate majors and 5 master's degree programs including:

Undergraduate

Aerospace
Chemical
Civil
Electrical
Computer
Engineering Technology - General
Engineering Technology - Construction
Engineering Technology - Electronics & Computer
Industrial
Manufacturing
Mechanical

Minors

Energy
Materials

Graduate

Civil
Electrical
Mechanical
Engineering Management
Engineering (with emphasis in Aerospace)

- **Provides an excellent and affordable education**
- **Ranked first in California degree awarding to Hispanic engineers, *Engineering Workforce Commission***
- **Cal Poly Pomona is currently ranked 14th for undergraduate engineering, *U.S. News & World Report***
- **6th Nationally recognized Civil Engineering undergraduate program, *U.S. News & World Report***

We invite you to read about our research facilities, laboratories, and faculty expertise. Our faculty have diverse expertise and technical capabilities. We have the engineering talent and facilities to create collaborations of great value for our partners.

There are Many Ways to Partner with Us

Southern California Edison Sponsors Tehachapi Wind Energy Storage Project at Cal Poly Pomona

The team will design, build, install, and test a battery energy storage system that utilizes utility-scale lithium-ion battery and smart inverter technology for improving grid performance and integrating wind generation. This project accelerates the advancement of reliable, technology for wind integration and other smart grid applications across California and the United States.

Industry
Sponsored
Research Projects

Government
Sponsored Research

College of
Engineering

JPL Supports Research Projects

JPL, has chosen the following projects to support: 1) Delta-sigma analog-to-digital converters implementation for a radiation tolerant environment. 2) low-cost solution to picosatellite attitude control. 3) Designing a deployable radiators, radiator turn-down devices, and duty-cycled cryocoolers. 4) Miniaturization of gas-sensing instrumentation for autonomous air platforms.

The Colombatto Family Sponsored Laboratory Development

The Colombatto Family Laboratory features 70 pieces of equipment used by the Department of Electrical & Computer Engineering and Department of Engineering Technology. The digital multimeter, oscilloscope, function generator, power supply and Dell OptiPlex computer allow for building, testing and troubleshooting electrical circuits. The new versions are more advanced, more precise and provide a wider range of functions.

Alumni Support

Community
Engagement



Community Partnership with Casa Colina Center for Rehabilitation at Pomona

The Casa Colina Center is interested in the results of Dr. Norali Permalete NSF sponsored research using haptic robotics system to improve the motor skills in children who have trouble processing visual information to guide their motor skills such as a simple task of using spoon to eat.

College Leadership

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Dean

Dr. Cordelia Ontiveros
Associate Dean for Academic
Programs & Student Services

Dr. Ben Bahr
Associate Dean for Research
& Graduate Studies

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Director, MEP

Patrick E. Stewart
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Clifford M. Stover
Director of Engineering
Laboratory and Facilities

Department Chairs

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Aerospace Engineering

Dr. Francelina Neto
Civil Engineering

Dr. Massoud Moussavi
Engineering Technology

Dr. Angela Shih
Mechanical Engineering

Dr. Vilupanur Ravi
Chemical and Materials
Engineering

Dr. Saeed Monemi
Electrical and Computer
Engineering

Dr. Abdul Sadat
Industrial and Manufacturing
Engineering

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Fluor Corporation

Jonathan Yee

CEO
TruePoint Systems

Research Facilities & Laboratories

Wind Tunnel Complex

Subsonic Wind Tunnel

The new *Subsonic Wind Tunnel* is a continuous flow tunnel that employs a sting balance for center mounted wind tunnel models for angles of attack to 35 degrees, and yaw angles of 20 degrees. Additionally, a patented model to sting mount gimbaled mechanism is an option that enables RC models to be “flown” by a pilot in the wind tunnel to simulate free flight in roll, pitch, yaw, vertical translation, and side translation. This capability is unique among research tunnels for testing of dynamic stability derivatives, gust response, flutter, stability augmentation, and gust and flutter suppression systems.

A new side wall mount capability provides testing of semi-span aerodynamic surfaces that can double the test Reynolds number in the 40” x 28” test section. The maximum speed is 200 mph. The sting is coupled to an automated programmable pitch and yaw control capability, and integrated with an automated data acquisition system to minimize test time and user error.

Supersonic Blow-down Wind Tunnel

The new *Supersonic Wind Tunnel Lab* offers research testing up to Mach 3.7. The test section is 8” x 8”, with the capability to change the mach number during a blow-down run. The model mounts to a sting balance. Shock visualization equipment and state-of-the-art data acquisition and software has also been installed.



Unmanned Aerial Vehicle (UAV)

UAV Lab

Cal Poly Pomona's Colleges of Engineering and Science are engaged in many aspects of uninhabited aerial vehicle (UAV) research using both aircraft and helicopters. Our current research involves the development and validation of flight dynamics models, control system design, development of robust controllers, intelligent control of UAVs, collaboration between UAVs and ground vehicles, image processing for target recognition, tracking of mobile targets using UAVs, obstacle avoidance, and development of avionics systems for control of multiple vehicles.

CPP's UAV Lab maintains Piccolo autopilots, ground control stations, and multiple Hardware-in-the-Loop (HIL) simulation environments. Flying test beds consist of a fleet of ten fixed- and rotary-wing UAVs, including:

- The Yamaha *R-MAX* helicopter 10 ft. dia. Rotor, 65 lb. payload and autopilot was donated to the university by Northrop Grumman and is equipped with *WePilot* for autonomous flight.
- Thunder-Tiger *Raptor 90* & *SR-100* helicopter, which is also capable of autonomous flight and is equipped with a remotely positionable video camera.
- Telemaster single engine RC aircraft model, 12 ft. wing span with Piccolo autopilot and camera
- MP Trainer 5.75 wing span, with MP2128 autopilot
- Twin engine RC models, 11.2 ft. wing span with air data sensors, USI



Flight Controls and Simulation

Flight Controls and Simulation

The Flight Controls and Simulation Lab includes six controls experiments, each with a PC & software. These computer controlled systems include advanced data processing and interface software. The lab is intended to provide students, by means of experiments, a basic knowledge of Feedback Control Systems. Students learn about Mathematical Models of Physical Systems and System Identification, Feedback Control Systems (Characteristics, Performance, and Stability), Frequency Response Methods, Stability in the Frequency Domain, Time Domain Analysis, and Design of PID controllers.

The Lab also consists of an X-Plane and flight simulator computer. The X-Plane is the world's most comprehensive and powerful flight simulator for personal computers. It's a tool that can be used to predict the flying qualities of fixed- and rotary-wing aircraft. This incredible accuracy makes it a great tool for predicting aircraft performance and handling. The X-Plane software is used by students to learn to fly in simulation.



Astronautics



Astronautics Lab

The astronautics lab consists of lab facilities and capabilities to design, construct and ground test CubeSats, rockets, balloons and other space projects.

Key test beds and equipment include:

- 3U CubeSat kits from Pumpkin, Inc., including frames, processors, etc.
- Ground simulators for CubeSat logic boards ECP Model 750 Control moment gyro demonstrator & data acquisition system.
- High altitude ballooning: amateur transceivers, some balloon handling hardware, recording video cameras
- High-power solid rocket, with inertial measurement unit, flight computer, and recovery equipment

The lab continues to do research using sounding rockets including controlled powered flight; high altitude balloons as scientific platforms; and CubeSats as spacecraft design and experimental platforms including Zero G flights in the NASA JSC B-737 test bed.

Dynamic Structures Testing



Dynamic Structures Lab

The Dynamic Structures Lab can test large sized component and structures such as complete small to medium sized UAV's, general aviation major aero surfaces, large UAV tails, helicopter blades, and medium sized space craft.

An industrial quality Oros Ground Vibration Test system includes a signal analyzer with mode shape visualization, instrumented impact hammer, shaker, and multiple accelerometers. The Dynamic Structures Lab includes "True Structures" strain analysis systems, 3 models: Wing, I-Beam or Tube; 4 Material Testing Sets. Strong-back for mounting large structures and a MTS for material strength properties. Four new Amatrol Materials Testing Apparatus model 9014 are capable of experiments for testing : x Tensile, compression, bending, shear, bearing and hardness tests x Photoelastic polariscope accessory.

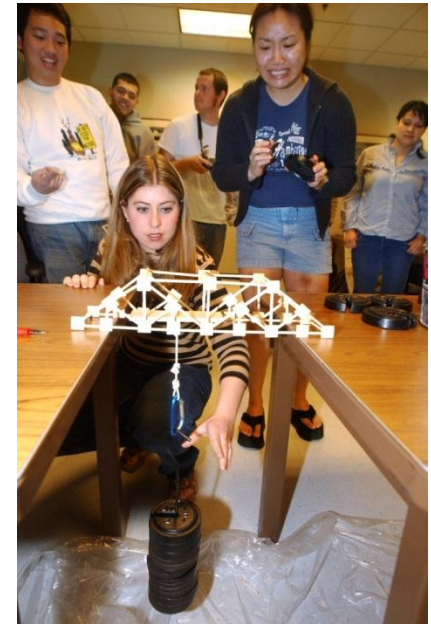


Structural Mechanics and Vibration

Earthquake Simulation

Biaxial earthquake simulations can be performed in the Civil Engineering Department Structural Mechanics Laboratory using a floor-mounted shake table and dynamic data acquisition system. The shake table specifications are as follows:

Shake table parameter	SI units	English units
Payload dimensions	71.1 x 71.1 cm	2'-4" x 2'-4"
Maximum payload at 1g	100 kg	220 lbs
Maximum travel	21.59 cm in X & Y	8.5 in. in X & Y
Operational bandwidth	20 Hz in X & Y	20 Hz in X & Y
Peak velocity	154.6 cm/s in X & Y	5.07 ft/s in X & Y
Peak acceleration	10.98 g [X], 17.79 g [Y]	10.98 g [X], 17.79 g [Y]



Structural Engineering Curriculum

The lab supports experimental activities for structural testing laboratory, MS projects, senior projects, and Cal Poly Pomona's Seismic Design Team. These capabilities are complemented by computer software capabilities for performing linear and nonlinear dynamic structural analysis and design.

CAD/CAM and CIM

CAD/CAM Lab

This laboratory is equipped with the state-of-the-art CAD and CAM software that students use to design their projects. After the Design and Analysis, the CAM software are used to develop the appropriate code for the CNC or the rapid prototyping machines.

CIM Lab

The CIM lab supports a wide range of instructional research, and eventually technology transfer activities. This laboratory provides a high quality laboratory experience for the students and covers manufacturing automation, advanced material processing, or computer assisted and computer controlled manufacturing. The lab is equipped with Gould, Siemens, and Allen Bradley Rockwell Programmable Controllers to facilitate discrete control as well as integration of the equipment in the lab. The lab is also equipped with two Seiko D Tran Robots, a Solar Cell Robots and two controllable conveyors to support the robotics and to facilitate automation of materials handling and the automation of the cells.



Advanced Manufacturing

Manufacturing Processes Laboratory

The Manufacturing Processes Laboratory has been greatly enhanced with the recent purchase of two HAAS CNC machines: a TL1 Lathe and a TM1P Mill. These will allow the introduction of CNC technology into our Fundamentals of Manufacturing Processes courses as well as performing manufacturing research. The lab also has 18 lathes and 8 mills, and various shears, presses, benders, rollers, etc.

Materials Joining Laboratory

The materials joining laboratory is equipped with 18 fully equipped stations with Gas Tungsten Arc Welding (TIG), Gas Metal Arc Welding (MIG), Shielded Metal Arc Welding (Stick), and oxyacetylene welding, brazing and soldering. Many different types of materials are joined including but not limited to steel, brass, bronze, and even difficult to weld metals such as aluminum. The lab also has cutting equipment in the form of a plasma cutter and oxyacetylene cutting for steel.

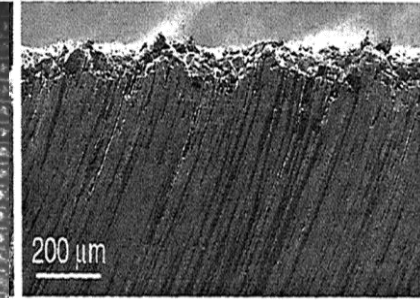
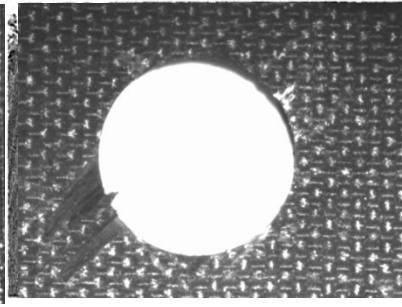
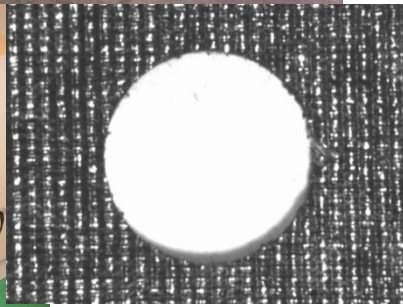


Machining of Metals and Composites

Machining Research

Research activities related to machining operations are conducted in this laboratory. This lab is equipped with machine tools and measurement equipment that are suitable for machining operations research.

The lab is mainly devoted to the following research activities: (a) Surface and subsurface damage as a result of machining operations is evaluated using various techniques. Both traditional metals and nontraditional metals such as metal matrix composites are studied. (b) Delamination of fiber-reinforced composites caused by machining is studied and (c) Tool wear studies when machining conventional metals, metal matrix composites and fiber-reinforced materials are carried out using various cutting tool materials.

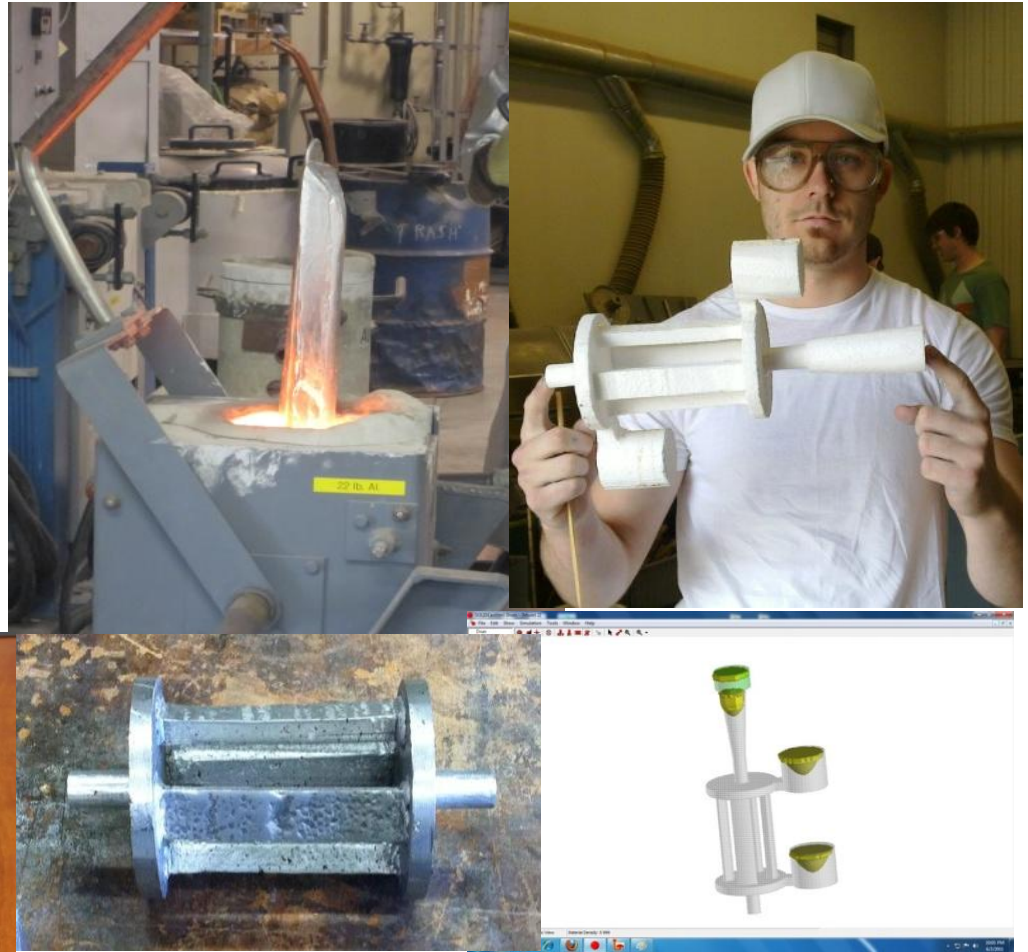


Advanced Foundry

Foundry Laboratory

The foundry facility is where engineering and casting of products in many alloys and processes takes place. The Induction Furnace system with three differently sized melting pots allows for the melting of many alloys including steel, brass, bronze, zinc, and up to 200 lbs of aluminum.

The parts are engineered with the use of SolidCAST software and then made into actual parts. The fully equipped pattern shop allows for the production of loose and match-plate wood patterns. In addition, innovative lost foam patterns can also be constructed. Casting processes that are performed include green sand, chemically bonded sand, investment casting and lost foam casting.



Composite Fabrication and Testing



High Temperature Autoclave

Complex composite structures can be fabricated using a new 3 feet diameter by 6 feet long autoclave. The lab has a large layup room and working tables for building and repair of composite parts, and a large freezer for storage of prepreg.

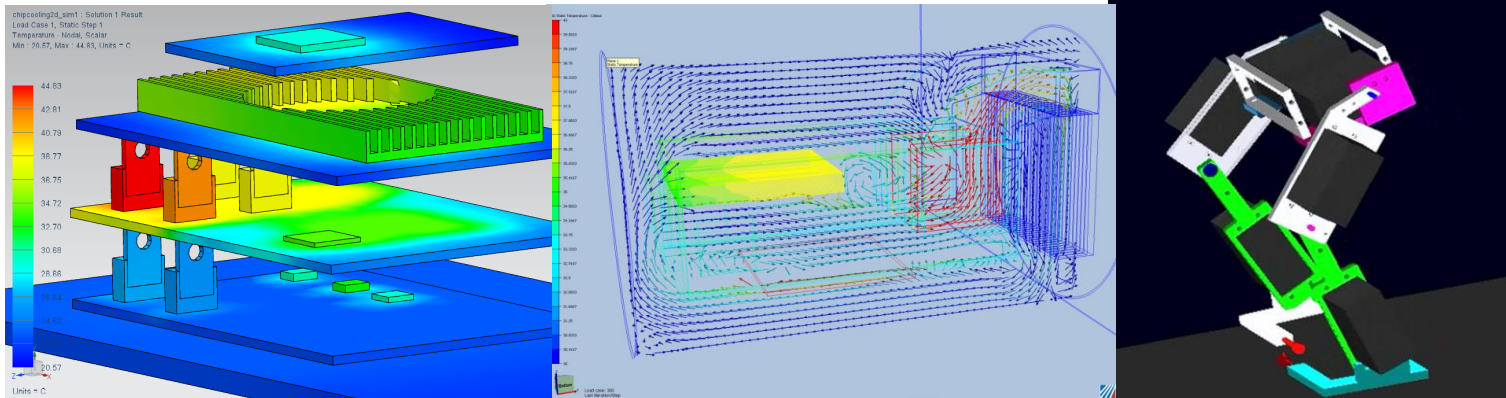
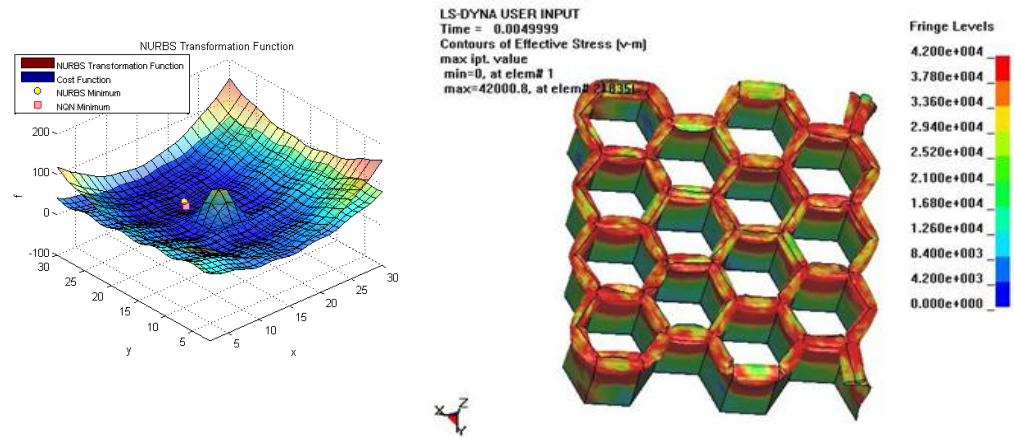
Research applications for the autoclave include fabrication of structural test coupons of new composite materials, wind tunnel models for dynamically scaled aeroelastic wings, helicopter rotor blades, complete aircraft models, composite parts for various robotic mechanisms, CubeSats frames, automobile structures, composite bridge member test specimens, and other composite materials applications.

The autoclave is available for future student and industry composites research projects including fabrication of new composite material structures and novel composite structural design applications.

Computer Aided Analysis

Computer Aided Analysis

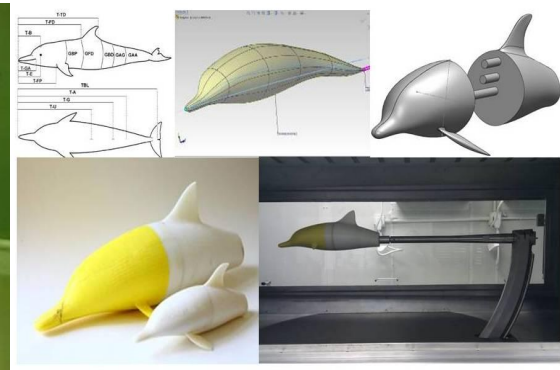
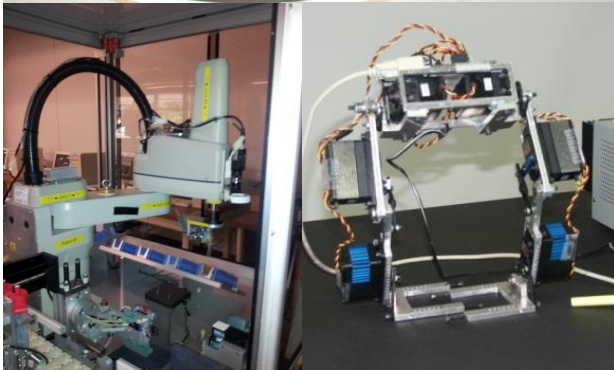
There are several laboratories within the college, each with their own specialized software for modeling and analyzing. The CAD Models are used to perform Computational Fluid Dynamics Analysis (CFD), Finite Element Analysis (FEA), and Kinematic and Dynamic Analysis.



Robotics and Mechatronics

Mechatronics and Robotics Research

This is an interdisciplinary program, and the research includes a wide variety of interests. In the undergraduate level, the students compete in sumo, line following, or navigating a maze. In addition, the students are encouraged to do other creative projects such as the design of a low-cost rapid prototyping machine. At the graduate level, the research includes exoskeletons for disabled people and voice-activated wheelchairs. Man-machine interfaces such as oral command for task execution, and biologically inspired robotic research.



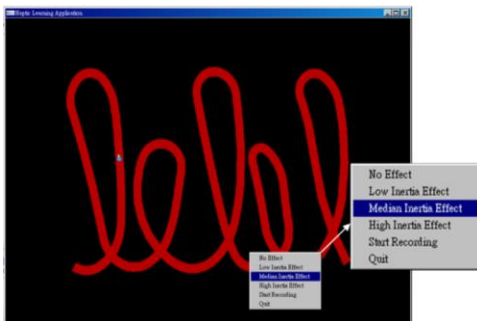
Human Engineering and Haptic

Work Simulator

As a part of analyzing human work performance under a variety of postures, force exertions, and task specifications, equipment such as BTE Work Simulator is used in this laboratory. Tools and equipment could be redesigned and developed based on findings of capabilities and limitations of human performance prior to causing problems associated with human health, product quality, or equipment misuse.

Anthropometric, Human Performance, and Environmental Analysis experimental tools

In order to optimize the human performance, all aspects of workstations and working environments should be analyzed. The Human Engineering lab has the capabilities of providing tools for research and analysis of such environments and provides design guidelines for tools, workstations and facilities.



Mixed-Signal System-on-a-Chip

Specialization

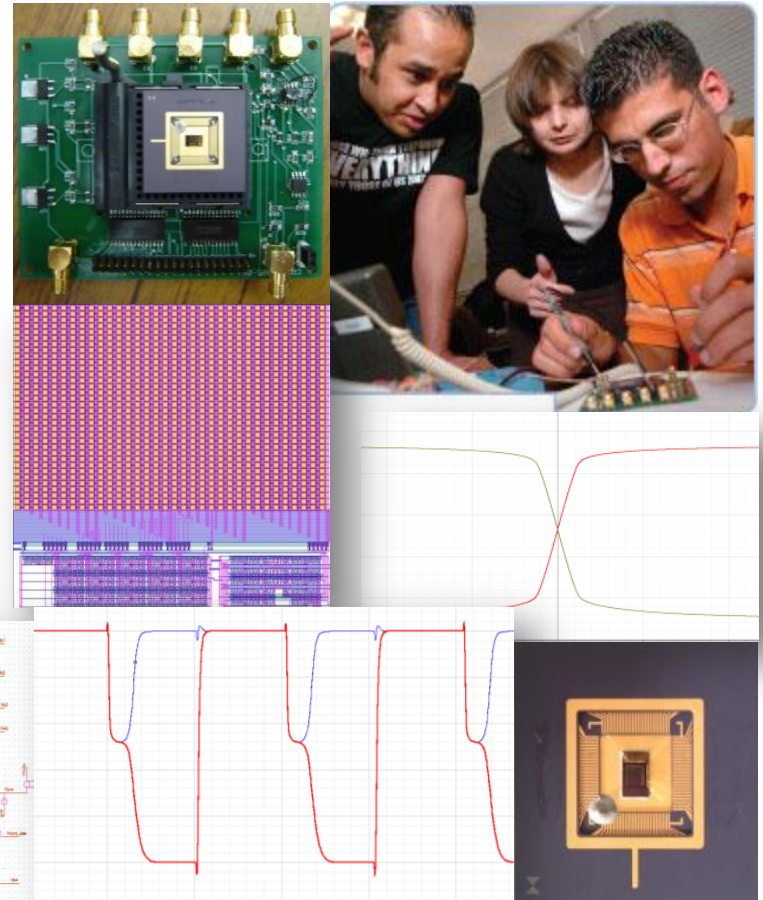
Specializing in the development of advanced image sensors and ROICs for FPAs

Advanced Image Sensor and Readout Integrated Circuit Development Laboratory

Cal Poly Pomona is one of the few universities in the world that specializes in the design and development of CMOS image sensors and readout integrated circuits (ROICs) for focal plane (FPA) arrays.

Recent projects include:

- Low noise readout integrated circuit for characterization of organic semiconductor materials and devices
- 8Mfps ROIC operating in burst mode for IR FPA with 10-bit ADC
- Novel pixel architectures for CMOS SPAD image sensors



Photonics, Illumination and Lighting

Photonics

Design, build, and document laboratory experiments including the Michelson and scanning Fabry-Perot interferometers, the determination of semiconductor band gaps by optical absorption spectroscopy, spatial and spectral characterization of LEDs and photodiodes, and applications of Fourier optics.

Lamp Characteristics

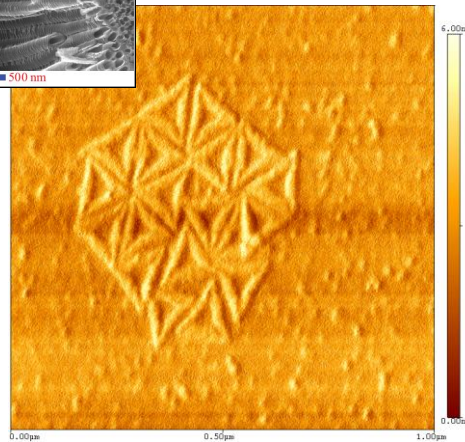
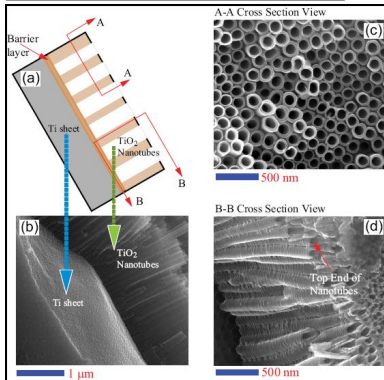
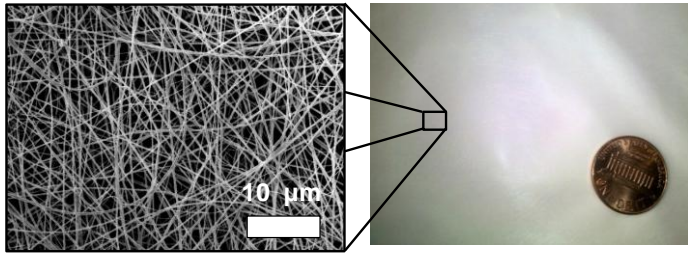
This laboratory is equipped with test equipment for determining the Total Lumen Output of lamps for various types including fluorescent, induction and LEDs. Power output is available in tabular form with calculations that are made in 10 nm increments over the visible spectrum. Their sizes range from 9 inches to 5 feet. Lamp sizes can vary from small LEDs to four foot fluorescent lamps. Auxiliary equipment provides the data for determining fixture efficiency, temperature profiles, and power consumption.

Ballast/ Lamp Electrical Tests

A full complement of electronic test equipment can measure the characteristics of ballasts, power supplies, and control systems. Properties of ballasts such as input power, harmonics, temperature sensitivity, and power factor can be measured. Data acquisition equipment is available for running both short and long term tests. An oven is available for testing both lamps and their associated electronics which are sensitive to temperature variations.



Nanotechnology



Atomic Force Microscope

This instrument characterizes the properties of surfaces at the nanometer scale laterally with sub-nanometer resolution vertically. It is equipped to image in solutions. A variety of other nanoscale measurements are possible including SEM and lithography.

Surface Profilometer

This instrument measures surface morphology along a line. It provides nanometer scale vertical measurements.

Multi-wavelength Ellipsometer

This instrument provides a non-contact determination of the thickness of a film on a substrate.

Other Instruments

- Optical microscope (1000x max, image capture)
- Scanning Electron Microscope (SEM)
- 4-point probe (electrical resistivity)
- Fourier transform infrared (FTIR) spectrometer

Microwave/RF and Radar

Microwave and Wireless Communications Laboratories

Cal Poly Pomona is one of the few universities, which has the distinction of comprehensive Radio Frequency (RF), Microwave Engineering, Satellite & wireless communications programs for undergraduate and graduate students.

The Radio-Frequency Laboratory currently supports undergraduate and graduate courses in the areas of RF, microwave, applied electromagnetics and antenna theory. It provides hands-on experience in measurement techniques at RF/microwave frequencies ranging from 10 MHz to 18 GHz. It has eight working stations equipped with signal generators, slotted lines, waveguides, RF components, VSWR meters, and power meters. The laboratory has six modern network analyzers, four reflection/transmission test units, and a spectrum analyzer for extensive microwave circuit design and characterization up to 18 GHz. It also has an anechoic chamber for antenna and EMI/RFI measurements.



High Temperature Coatings

High Temperature Coatings

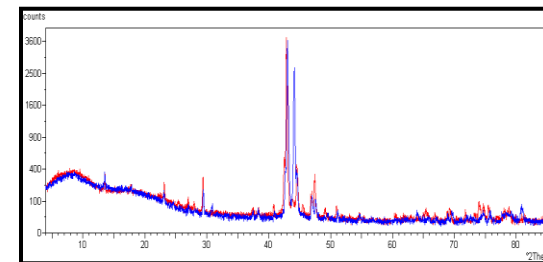
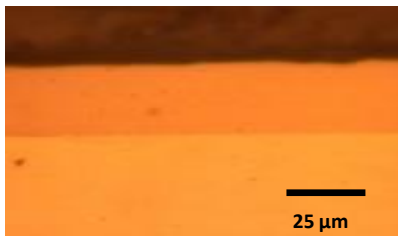
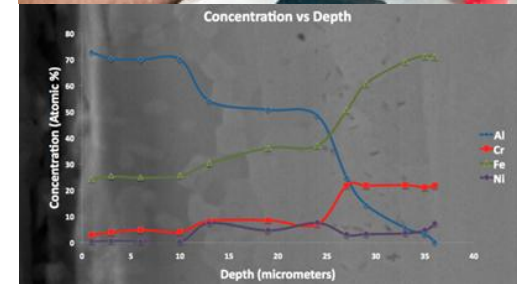
Degradation of metallic materials at high temperatures occurs through different mechanisms, e.g., oxidation in air, attack in carbonaceous environments (“metal dusting”), accelerated corrosion under fused salt films (“hot corrosion”), etc. The application of protective coatings is one way to protect the metals against such attacks. At Cal Poly Pomona, Halide Activated Pack Cementation (HAPC) is a technique that has been extensively employed to apply corrosion-resistant and very hard coatings to metallic substrates. HAPC is a versatile and economical approach to apply coatings of desired compositions to a range of substrates, typically nickel and iron-based alloys.

Coating Capabilities

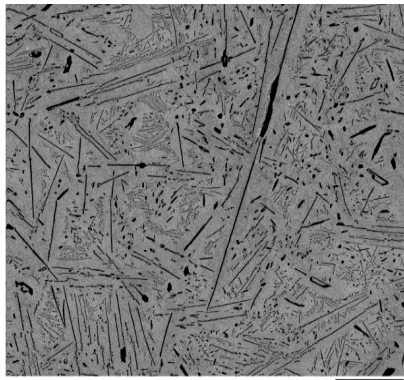
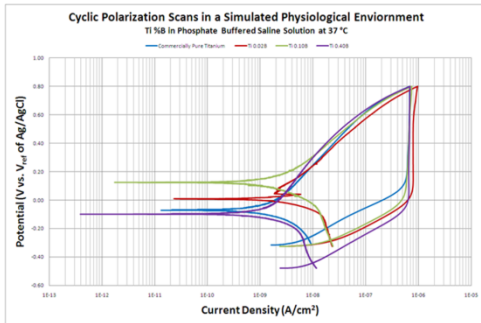
High temperature tube furnaces (Lindberg Blue M, 48” alumina tube furnaces)

High Temperature Corrosion Test Capabilities

Box furnaces (Carbolite RHS 1600, Pacific, Tenco) are available to test uncoated and coated materials at high temperatures and under molten salt solutions or films.



Environmental Stability and Corrosion Testing



100µm



Corrosion test capabilities – general and industrial

The corrosion labs at Cal Poly Pomona house state-of-the-art electrochemical test equipment (Perkin Elmer, Gamry and Biologic potentiostats; flat and round corrosion cells, computer and software for data acquisition and analysis) to perform corrosion tests on samples using ac and dc techniques. High temperature and Corrosion tests can also be conducted at high temperatures and Sample preparation equipment include dry and wet cut-off (Buehler 8" abrasive cutoff saw, Leco 12" wet cutoff saw), diamond saws for precision cuts (Buehler Isomet, South Bay Technologies), drills, grinding wheels, belt sanders; (Metallography) Sample mounting (several Buehler specimen mount presses), grinding (Buehler Surfmet grinder) and polishing (Buehler dual 8" wheel grinder/polisher, Buehler Mini Met, Buehler Vibromet) capabilities. Microscopy capabilities include optical microscopes (Olympus, Neophot 2 metallurgical microscopes) attached with digital image acquisition capabilities, computer and software for image analysis; Atomic Force Microscope (AFM).

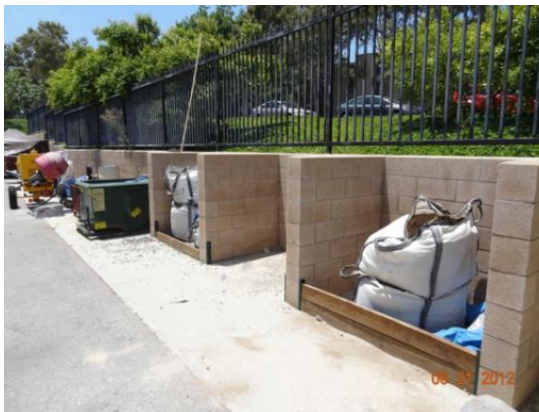
Biomedical Test Capabilities

Tests can be performed in a variety of solutions and from room to body temperatures. Through a collaboration with biological sciences, in vitro biological tests can be performed, e.g. analysis of bone resorption (BD BioCoat Osteologic Bone Cell Culture System).

Aggregates, Concrete, and Asphalt Testing

Aggregates, Concrete, and Asphalt Testing

This laboratory has all the equipment necessary for coarse and fine aggregate characterization in support of portland cement concrete mix design. Mixing, curing and testing of concrete cylinders and beams is routinely performed. In addition, the lab is equipped with Marshal compaction and testing equipment used in the evaluation of cold recycled asphalt concrete test specimens. Outside storage facilities are available for aggregates, cement, asphalt and reclaimed asphalt pavement (RAP). This laboratory provides a space for Civil Engineering students to conduct special projects and undergraduate and graduate research on concrete and asphalt and pavement structures.



Water Analysis Laboratory

Water Quality

Quality analysis of surface water, runoff water, and groundwater can be performed in the Water analysis lab. Each standard testing method is used to determine turbidity, color, pH, conductivity, suspended & dissolved solids, alkalinity, hardness, iron, coliform bacteria (via the membrane filtration and MPN methods), and free & total chlorine. Additionally, chloride, nitrate, fluoride, bromide, sulfate, phosphate and nitrate concentrations are determined with a Dionex IC 1100. This laboratory provides a space to conduct special projects to evaluate field problems and propose innovative solutions



Hydraulics Laboratory

Hydraulics Engineering in the Curriculum

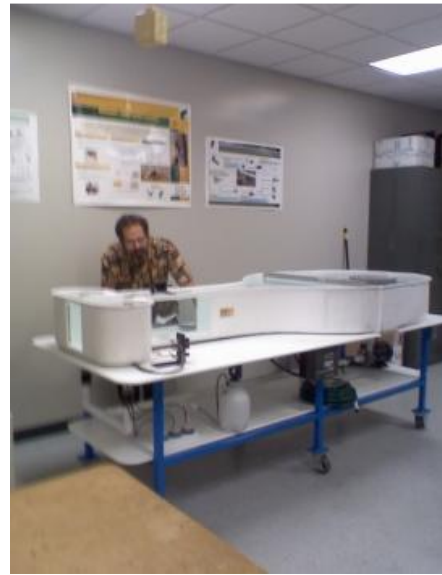
Students learn analysis and related design of pressure (pipe) flow, open channel flow and special topics for civil engineers involving basic head loss equations, pipe in series and parallel, pipe networks, critical flow, uniform flow, non-uniform flow, pump stations and culverts. Students also learn to use proprietary software to analyze and design water network and stormdrain systems.

Lab Testing Capabilities

- Determine friction coefficients for new and old pipelines
- Assess discharge coefficients for pressure differential flow meters
- Pump performance testing for stand alone, parallel, and series configurations
- Calibrating HVAC flow in a rectangular duct
- Using Weirs to determine discharge in an open channel
- Determination of drag & drag coefficient for boat hulls

Water Tunnel

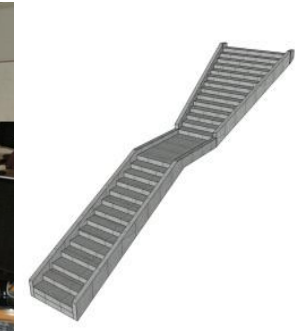
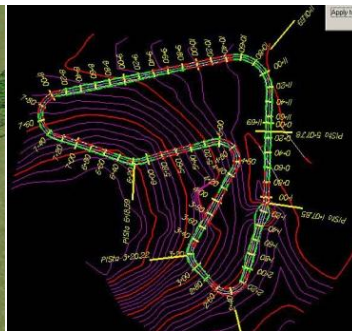
- Used to study fluid flow patterns such as vortices and separation over aerospace vehicles.



Geospatial Information Systems Laboratory

GIS, Visualization and Animation

The 30 photogrammetric flat screen workstations of this lab are used for instruction and for 3D modeling and visualization of aerial photography and spaceborne imagery to support ground and man-made structures' fly-through, earthwork processing, database management and spatial analysis, and GPS data processing. The lab also has the capability to allow the use of cloud point technology from laser scanning data. The main focus of this lab is in digital mapping support of civil and surveying engineering projects.



Geospatial information systems in the curriculum

The lab supports instruction in Geographical Information Systems (GIS), Land Development and Subdivision Engineering, Photogrammetry, Geographical Data Capture, Global Positioning System (GPS), 3D Visualization and Animation, 3D Laser Digital Mapping, as well as a variety of design projects in the various areas of civil engineering.



Transportation Laboratory

Traffic and Transportation

This laboratory provides a hands-on environment for Civil Engineering students to conduct a wide range of transportation-related projects, including infrastructure geometric design, multi-modal macro/microscopic traffic simulation, sophisticated transportation network modeling, hands-on Hardware-In-Loop simulation design, integrated corridor management, Intelligent Transportation Systems Technologies, travel demand model development, statistical analysis of crash data and household survey data, crash reconstruction, airport design, and so on.

The lab houses a large set of traffic and transportation-related equipment and devices, including Econolite and McCain signal controller systems (Centracs and QuicNet), traffic data collectors, solar-powered traffic control devices, and various software packages such as VISSIM, SYNCHRO, SIM-TRAFFIC, CUBE, SSAM, HCS, etc. The lab also has a live AVL-based Bronco Shuttle system (<http://www.broncoshuttle.com>) that produces real time data for transit service analysis.



Surveying Laboratory

Field Surveying and GPS

The surveying laboratory is equipped with 16 total stations and 2 robotic total stations for field surveying, plus 8 digital levels. Additional 6 dual frequency GPS receivers allow for static and real time kinematic (RTK) data collection. One Trimble Laser Scanner adds to the capability of the laboratory for point cloud data collection and digital survey of structures and surroundings.



Geospatial information systems in the curriculum

The lab supports Global Positioning Systems (GPS), field surveying and data collection systems for a variety of civil and construction engineering projects.

Energy Systems

Energy Systems

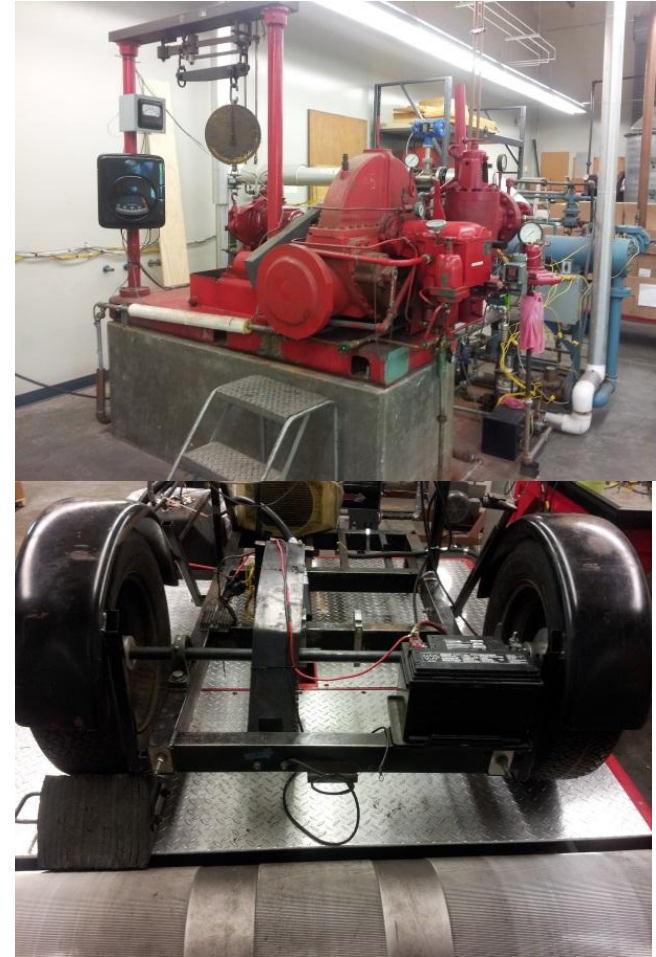
The Energy Systems Laboratory consists of the Heat Power Lab and the Engines Lab. This lab is also used for a variety of Special Projects and Senior Projects related to engines, power plants and renewable energy systems.

Heat Power Lab

The Heat Power Lab is an operating steam power plant. It consists of a 50 hp steam turbine, dynamometer, boiler, condenser, cooling tower, pumps, and all associated pipes, valves and instrumentation. Data can be taken and the system can be controlled manually, or by use of a computerized data acquisition and control system.

Engines Lab

The Engines Lab allows students to develop an understanding of internal combustion engines. It consists of many full-sized engines, not desktop models, including a V-8 gasoline engine, an inline-6 diesel engine, a Cooperative Fuel Research (CFR) engine, and a variety of other engines and support equipment such as chassis dynamometer.



Jet Engine Test Cell

Jet Engine Test Cell

The SR-30 "Mini-Lab" Jet Engine and Test Cell by Turbine Technologies Ltd., has a maximum RPM $\sim 90,000$ and maximum thrust ~ 22 pounds. It has sixteen sensors including five stations of pressure and temperature measurement sensors throughout the engine, a balance for measuring thrust, and other sensors for measuring engine fuel flow and RPM. The automated data acquisition and real-time display system provides all sensor time histories at high sample rates.

The engine is capable of researching the performance, emissions and acoustics of various fuels including bio-fuels. The removable inlet and nozzle sound suppressors, enclosed cabinet, and auto start and shut-down systems enhance its usability.



Smart Grid and Energy Management

Smart Grid

The *Smart Grid lab* is a new facility and one of the latest research laboratory in Cal Poly Pomona. The most up-to-date techniques in software and system engineering are used to model, simulate and diagnose the power grid system. The research conducted in the lab entertains many different areas of interest in the smart grid technology such as: Power Generation Methods, Energy Management, Power Distribution and System Analysis, Substation Design, Metering, Cyber Security, Customer Information System (CIS), Interactive Voice Recognition (IVR), Automatic Vehicle Locator (AVL), Geographic Information System (GIS), Integrated Distribution Management System (IDMS), Outage Restoration Management System (ORMS), Supervisory Control And Data Acquisition (SCADA), Modeling and Simulation of Electric Grids.



Student Projects

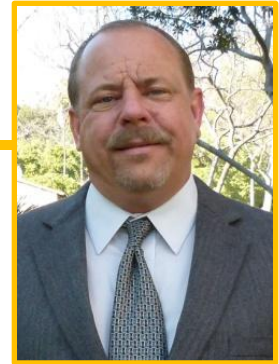
Undergraduate Engineering Projects

Project Development Labs

The College of Engineering Project Development laboratories offer students the unique opportunity to utilize space for development of engineering projects related to the field. These labs provide students a facility in which to actively develop, design, fabricate, and test engineering projects. The facility consists of professional machine tools and equipment for manufacturing and fabrication. Students use these applied laboratories to perform a broad range of tasks from Carbon Fiber layup to Vehicle Static and Dynamic Analysis and Engine Dynamometer testing.

Cal Poly Pomona Engineering students compete in many national and international interdisciplinary design competitions and perform extremely well. Some notable projects include the Society of Automotive Engineering (SAE) collegiate design series Formula SAE, Formula Hybrid, Baja SAE, SAE Supermileage, and SAE Aerodesign. Other large projects utilizing these laboratories are Solar Boat, Human Powered Vehicle, and Civil Engineering Bridge and Concrete Canoe who use the machine tools as part of their project development. In addition to large team projects, the laboratories are used by students from all disciplines to develop, design and manufacture many individual and small group research and development tasks, technical elective assignments, and senior design projects.

Clifford M. Stover

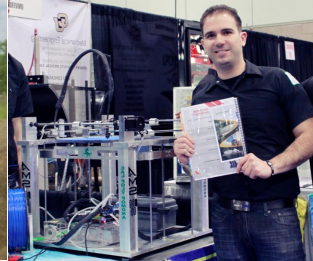


Expertise

- Machine Design
- Material Testing and Instrumentation
- Motorsports / Performance Engineering
- Automobile Forensics / Accident Reconstruction
- Engineering Management

Industry & Government Partners

- Cal Mesa Steel
- RBC Bearings
- Circor Corp.,
- Consulting and Law firms



Baja Society of Automotive Engineering International

The Baja SAE competition is a design project that was created to simulate real-world engineering problems and the challenges that arise from building such a vehicle. Each team is competing to have its design accepted for manufacture by a fictitious company. The students function as a team to promote, design, build, test and race these vehicles within the scope of the rules provided by SAE. The goal is to design and build a prototype four wheel single seat offroad vehicle intended for sale to the public. At the yearly SAE Baja events, the students compete in both static and dynamic events. The static events consist of engineering design, safety and cost presentations. The dynamic events consist of an acceleration – top speed – braking event, a maneuverability event, a hill climb event, and finally a 4-hour endurance race pitting all the vehicles against each other on an extremely rough off road course. The Briggs & Stratton Corporation generously donates a 10HP OHV engine to participating schools for this competition. There are no modifications allowed to the engine, leaving the students to focus their design skills on the chassis, suspension and all other aspects of vehicle design.

This international event is held yearly in South Africa, Brazil, Korea, India, and three north American events in the United States.



Formula Society of Automotive Engineering International

The Formula SAE event is an international competition and design project that was created to simulate real-world engineering problems and the challenges that must be addressed in the building of a single seat autocross type vehicle. Each team is competing to have its design accepted for manufacture by a fictitious company. The students function as a team to promote, design, build, test and race these vehicles within the scope of the rules provided by SAE. A key element in the design of the SAE Formula vehicle is the engine can be modified extensively within specifications designated by SAE International.

This project requires the students to assume that they are to produce a prototype car for evaluation as a production item intended for sale to the non-professional weekend autocross racer. These vehicles are judged in a series of static and dynamic events including: static inspection and engineering design, cost and marketing presentation, acceleration and braking, skid pad testing, autocross performance, and finally an endurance race.

This international event is held yearly in Spain, Hungary , Austria, Germany, Italy, Brazil, Japan, Australia, United Kingdom, and the two largest events in the United States.



Formula Electric/Hybrid Society of Automotive Engineering International

Formula Hybrid SAE is based on the successful Formula SAE program. It is a design competition that simulates real-world engineering problems and challenges students to design and build an open wheel single seat vehicle encouraging the development of alternative automotive drive trains with an emphasis on efficiency in a high-performance application.

Formula Hybrid focuses on development of new and innovative hybrid (gas / electric) and full electric drive power trains. Formula Hybrid SAE gives students the chance to function as a team to promote, design, build, test and race these vehicles within the scope of the rules provided by SAE. At the yearly international event the team puts its creation against others from around the world. The events consists of both static and dynamic events and the team is judged on its design, creativity, innovation and performance. Alternative power trains are the future, and Formula Hybrid SAE gives future engineers the opportunity to develop and test new and state-of-the-art power trains that may one day replace the traditional combustion engine.

This international event is held yearly in Spain, Hungary , Austria, Germany, Italy, Brazil, Japan, Australia, United Kingdom, and the United States.



Solar Boat Institute of Electrical and Electronics Engineers Power Electronics Society

The Cal Poly Pomona Solar Boat team is an undergraduate engineering organization dedicated to the promotion and use of solar energy. The Team researches, designs, and engineers all aspects of a solar-electric boat and compete yearly in Solar Splash, the world championship of intercollegiate solar boating.

The Cal Poly Pomona solar boat hull has recently been built of a carbon fiber composite with a honeycomb structure, making it extremely light and strong. This is a technique used to construct Olympic racing canoes.

The team is part of the Alternative Vehicle Club and has participated in Solar Splash since 2001. The Institute of Electrical and Electronics Engineers Power Electronics Society, an international technical organization, sponsors the annual competition.



Concrete Canoe

American Society of Civil Engineers

The concrete canoe team competes early at the Pacific Southwest Conference of the American Society of Civil Engineers. Students design and fabricate a concrete canoe to comply with specific competition rules. The project takes one full academic year and culminates with the construction and testing of the concrete canoe in the regional competition. The Cal Poly Pomona team has been consistently placing in the top two places in the regional competition, and in the top eight in the Nationals.

The team has to design and construct a concrete canoe that meets all the competition requirements for dimensions and weight, and is classified in terms of its innovative structure and fabrication methods, materials mixing, technical paper, aesthetics, and speed.



Steel Bridge

American Society of Civil Engineers

The Steel bridge team competes early at the Pacific Southwest Conference of the American Society of Civil Engineers. Students design and fabricate a model steel bridge to comply with specific competition rules. The project takes one full academic year and culminates with the construction and testing of the steel bridge in the regional competition.



The team has to design and construct a model bridge steel bridge that meets all the competition requirements including, but not limited to, member sizing connection design; constructability; structural stability; structural efficiency; and deflection constrain.



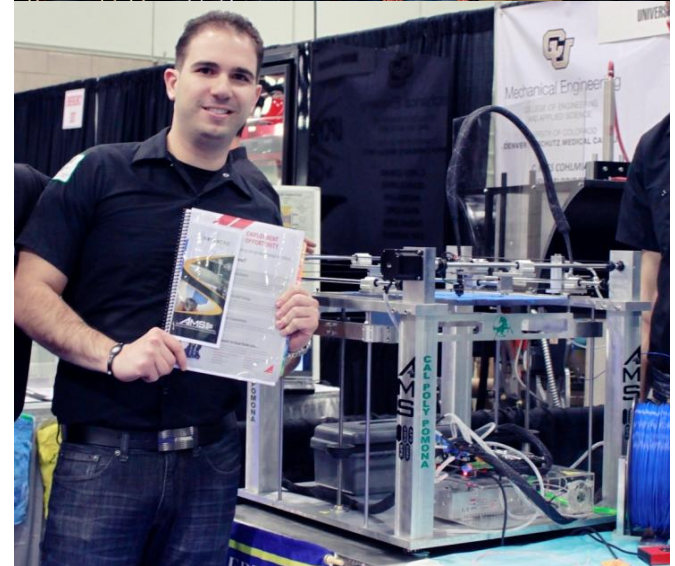
Student Manufacturing Challenge

Society of Manufacturing Engineers

The Student Manufacturing Challenge is a national level competition sponsored by the Society of Manufacturing Engineers. It is held every year in their WESTEC or AeroDEF shows in Southern California. The competition consists of each school team designing a project and executing it from scratch every year. Sample projects over the years include a bicycle ambulance, 3D printers, CNC routers, solar water purifiers, etc.

The students have to come up with a concept and develop it within one year. The judging emphasizes teamwork and effectiveness of the team in successfully completing their project. Thus, the difficulty of the project, proper design and manufacturing documentation, quality of design, execution of prototype manufacture, cost estimation, etc. are judged.

The Cal Poly Pomona teams are typically multidisciplinary and have incorporated students in Manufacturing, Mechanical, Industrial, Electrical, and Aerospace Engineering as well as multiple branches of Engineering Technology.



Helicopter Main Rotor Noise Reduction by Use of Leading-Edge Serrations

A new kind of helicopter main rotor was designed and fabricated with straight trailing edge, but with serrations along the leading edge, as shown. A baseline rotor with the same airfoil but with conventional straight leading and trailing edges (CS) was also designed and fabricated. Both rotors were designed by the use of MATLAB and SolidWorks, analyzed by the use of Computational Fluid Dynamics Analysis (CFD) and Finite Element Analysis (FEA) and fabricated by the use of a 3-D Printer (a rapid prototyping machine). To assure blade structural integrity, one blade from the SLE rotor was statically tested to failure.

Noise measurements were made and a microphone array was used to measure the radiated noise. A Rotomotion SR-100 Radio Controlled helicopter was used to drive the rotors at various RPMs and collective pitch. Measured data showed that the SLE rotor, on average, had about 5 dB lower radiated noise. This is very promising and warrants further study.



Aeroelastic Wing Senior Project

The primary objective of the Aeroelastic Wing project was to experimentally demonstrate that by using active twist control of a flexible wing, aircraft cruise drag at multiple speeds and altitudes can be minimized. Current transport aircraft are manufactured with a “jig-twist” span-wise angle of attack distribution that will minimize drag only at one cruise altitude and speed. Flying at other altitudes will increase drag due to non-optimal wing twist. Reducing drag can save significant money on fuel, estimated to be approximately \$1 million a year on one commercial transport aircraft.

The flexible wing is actively twisted into the minimum drag shape by deflecting the wing trailing edge and leading edge control surfaces that produce aerodynamic moments in the twist direction. The chosen wing design represented a passenger type transport aircraft scaled down to a 30 inch semi-span model to fit into the Cal Poly Pomona Low-Speed Wind Tunnel. The scaled bending and torsion stiffness's were used to design and construct a flexible graphite/epoxy wing model. The wind tunnel test showed data trends that support the concept that the wing could be twisted into the minimum drag shape using various control surface deflections, thus supporting the concept of minimizing drag and saving fuel at multiple cruise altitudes.



Student Unmanned Aerial Systems Competition Association for Unmanned Vehicles International

The Student Unmanned Aerial Systems (SUAS) Competition organized by Association for Unmanned Vehicles International (AUVSI) is held in Webster Field, Maryland every year in the month of June.

Since 2010, Cal Poly Pomona students have been regularly participating in the competition, which requires an unmanned aerial vehicle (UAV) to identify shape, color, and location of simulated targets on the ground while flying autonomously. The camera onboard the UAV takes pictures of the simulated targets on the ground. The pictures are then sent to the ground computer. The image processing algorithm on the ground computer determines the target location, shape, size, and color. Alternatively, the images may be processed onboard.

The student team for this highly interdisciplinary project includes students from Aerospace Engineering, Electrical and Computer Engineering, and Computer Science Departments.



American Institute of Aeronautics and Astronautics Design-Build-Fly and Society of Automotive Engineering Heavy-Lift

The *Design-Build-Fly* competition (DBF) is sponsored by the American Institute of Aeronautics and Astronautics (AIAA). Its participating teams are required to design, build, and fly a radio-controlled aircraft that is capable of carrying a “specialized” payload and carry out several different missions.

Each team is required to submit a design report documenting their aircraft’s performance and specifications, including predicted flight performance.

The payloads and missions can be quite variable. One year the aircraft were required to carry anywhere from one to nine softball, the quantity determined by draw just before flight. The aircraft are flown over a closed course, and the total distance flown during a fixed time is a performance parameter. In addition, the teams are judged by how rapidly they can assemble and load their aircraft and have it ready to carry out its mission. There are also restrictions on the distance available to take off and land the aircraft.

A yearly competition is held in Kansas or Arizona, where 60-80 schools teams’ aircraft are “flown off” against each other. The teams are scored by a combination of the quality of their written report and their aircraft’s flight performance.

A similar competition, the *Heavy Lift* competition, is sponsored by the Society of Automotive Engineering and involves the design of aircraft specifically intended to takeoff and successfully fly with the maximum possible added payload mass. This competition is held in California or Texas.



University Student Launch Initiative International sponsored by NASA

The University Student Launch Initiative (USLI) is a NASA-sponsored international competition and design project that addresses all aspects of developing a rocket-powered vehicle. Each team is required to design a launch vehicle that will carry a scientific payload to a specified altitude. The team participates in numerous design reviews with NASA personnel, including preliminary and critical design reviews, and a flight-readiness review. The team's design must demonstrate that it satisfies safety standards as well as meeting the performance requirements.

This project requires the students to satisfy performance and safety requirements while at the same time staying within a fixed budget. The teams are scored by their oral presentation performance, written reports and submissions, and flight performance.

After carrying out the reviews remotely by telephone, NASA holds the conclusion of the event (flight competition and public viewing of all the projects together) each year at the Marshall Space Flight Center in Huntsville, Alabama.



Mini Rose Float Competition at Cal Poly Pomona for First Year Students

First Year Experience at Cal Poly Pomona encompasses campus-wide initiatives to provide first year students with unique experiences to support their academic and personal development. A goal of the First Year Experience is to enhance students' opportunities for success and retention in our highly demanding curriculum. Every winter quarter, engineering students who are enrolled in EGR100L put their creativity and determination to the test at the annual Mini Rose Float Competition. The student teams have approximately five weeks to design and build a float:

- This competition introduces students to engineering principles such as teamwork and problem solving.
- Floats must navigate a 30-foot parade route, including a speed bump and a bridge, and run on battery power, without remote control.



Faculty Expertise



Expertise

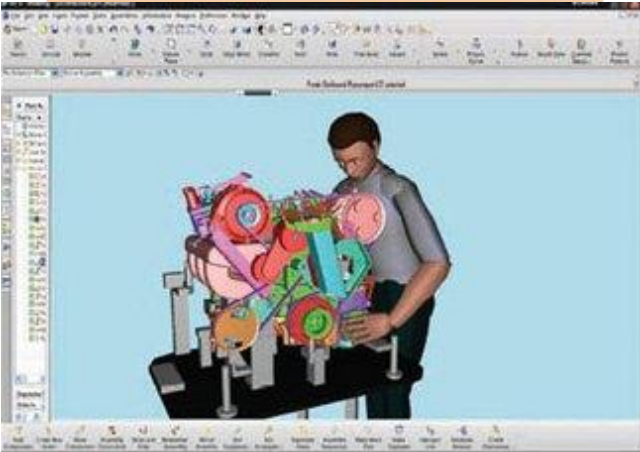
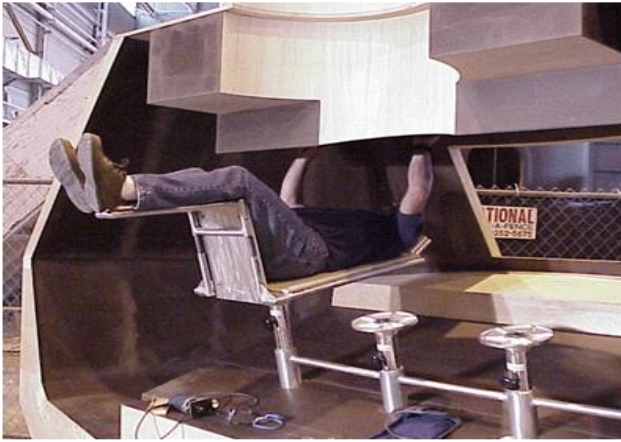
- Ergonomics and Human Engineering
- Production and supply Chain Planning
- Lean Manufacturing

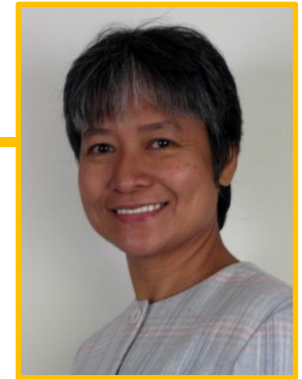
Industry & Government Partners

- National Science Foundation
- Texas Instruments

Research Interests

- Ergonomics and Biomechanical analysis
- Application of Lean in Service and Processes
- Supply Chain





Expertise

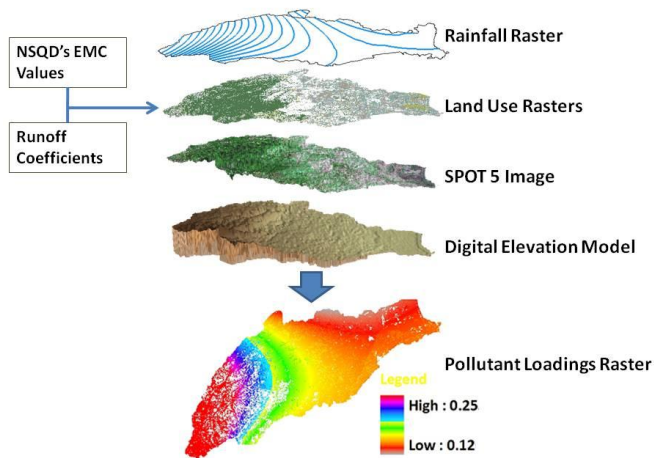
- Water Resources Modeling
- Geographic Information Systems (GIS)
- Remote Sensing

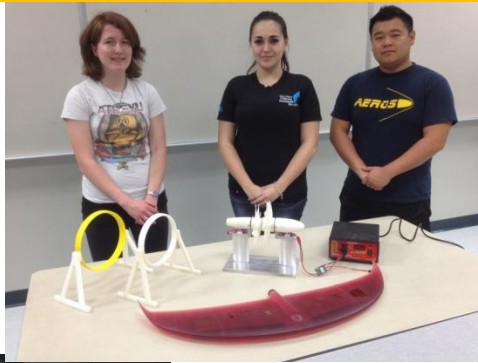
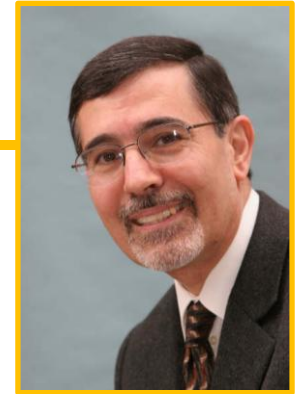
Industry & Government Partners

- National Aeronautics and Space Administration
- The Boeing Company
- Los Angeles Department of Water and Power
- Metropolitan Water District of Southern California

Research Interests

- Application of Geospatial Technologies in Urban Sustainability
- Stormwater and Groundwater Modeling
- Watershed, Stormwater, and Nonpoint Source Pollution Management
- Web GIS, including Crowdsourced and Volunteered Geographic Information





Expertise

- Aerodynamics
- Wind Tunnel Testing
- Airbreathing Propulsion
- Wind Engineering

Industry & Government Partners

- Air Force Research Labs (AFRL)
- Northrop Grumman Corp.
- NASA Dryden Research Center

Research Interests

- Wing designs for low drag and high lift
- Jet engine performance, noise and emissions
- Propfan aerodynamics and noise
- Wind turbines aerodynamics
- Rotors and propellers
- Vortex flows





Expertise

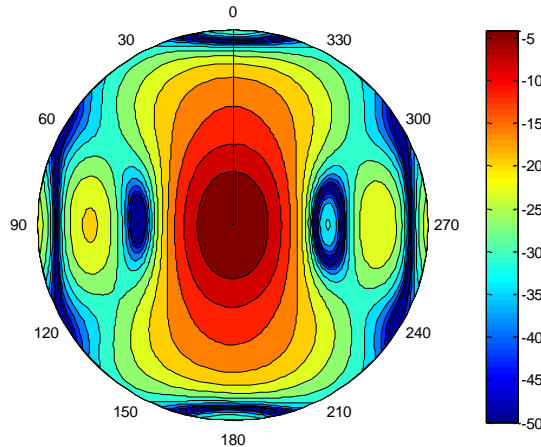
- Radar Signal Processing
- Digital Image Processing
- Digital Communication

Industry & Government Partners

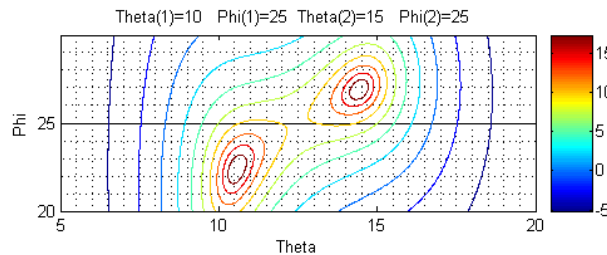
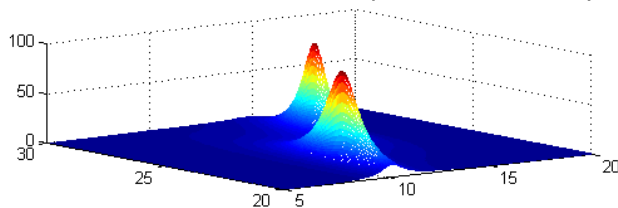
- Raytheon
- Department of Defense
- National Science Foundation

Research Interests

- Direction of Arrival (DOA) Estimation, Super-Resolution Algorithms
- Radar Clutter Suppression, Interference Suppression
- Antenna Pattern Design
- Image Detection and Tracking
- Microcontroller Applications



25 Sensors SNR = 20dB Subset element: [1 2 3 6 7 8 11 12 13]





Expertise

- Optimization
- Military Policy & Wargaming
- Transportation & Logistics

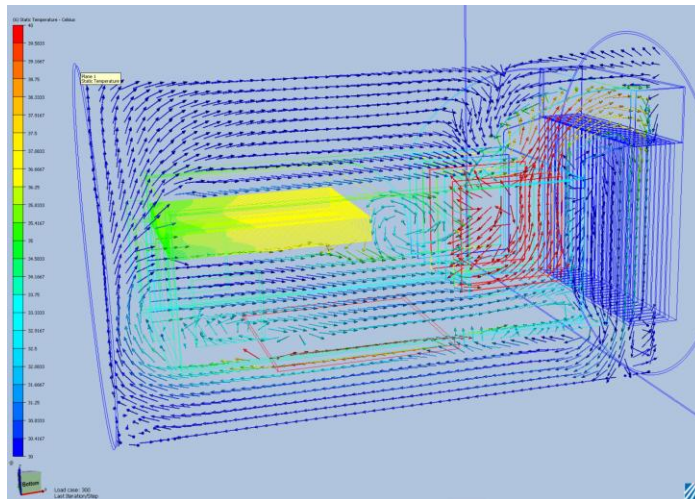
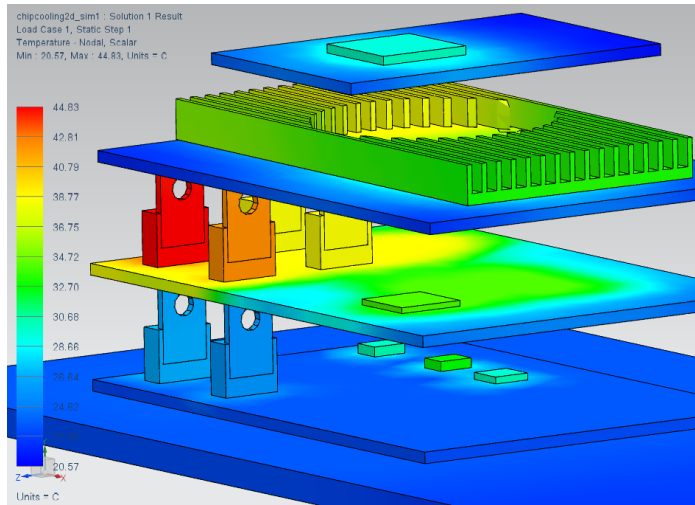
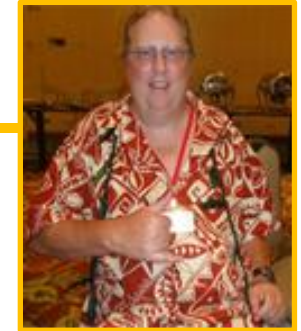
Industry & Government Partners

- Defense Logistics Agency
- Northrop Grumman
- Department of Labor

Research Interests

- Distributed Inventory Management Systems
- Mission Assurance Through Mitigating Cyber Vulnerabilities
- Modeling and Simulation
- Sense and Respond Logistics
- National Security





Expertise

- Computational Fluid Dynamics
- Spacecraft Thermal Control
- Renewable/Alternative Energies
- Electronics Cooling

Industry & Government Partners

- NASA Jet Propulsion Laboratory
- SIEMENS NX
- STAR CCM+

Research Interests

- CFD/ Fluid Structure Interaction
- Waste Energy Recovery Cycles
- Solar Thermal / Alternative & Renewable Energy
- Radiation Heat Transfer Simulation
- Thermal Control Systems Design and Analysis



Expertise

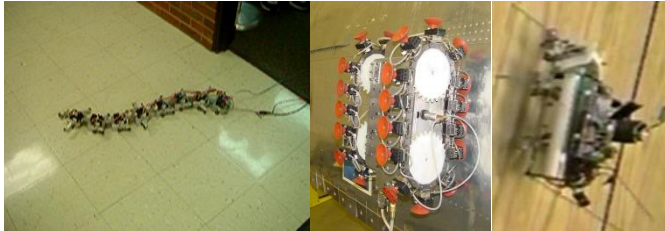
- Highway Materials
- Pavement Management
- Pavement Recycling

Industry & Government Partners

- Caltrans
- Asphalt Recycling and Reclaiming Association
- Federal Highway Administration

Research Interests

- Sustainable design, maintenance and rehabilitation of pavement structures
- In-place recycling of pavement structures
- Slurry surfacing systems
- Resilient response of unbound materials used in pavements



Expertise

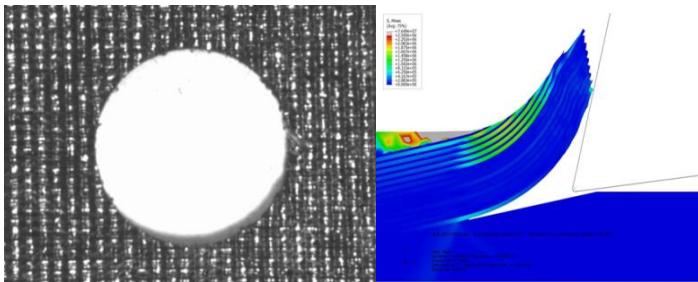
- Robotics, Controls and Mechatronics
- Manufacturing Systems and Manufacturing Automation
- CAD/CAM

Industry & Government Partners

- Boeing, Northrop Grumman, Cessna, Learjet and Hawker Beach
- Cytec Engineering Material, HITCO Carbon Composites, and Airtech International
- National Science Foundation

Research Interests

- Biologically Inspired Robotic Systems
- Person Centered Design and Haptic
- Robotics and Automated Assembly
- Search and Rescue Robotics
- Magnetorheological Fluid
- Composite Machining and Drilling
- Natural Fiber and Green Composite





Expertise

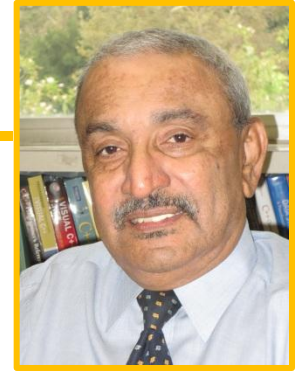
- Dynamics and Control of Unmanned Aerial Vehicles (UAVs)
- Aircraft System Identification
- Neural network based controllers for UAVs

Industry & Government Partners

- National Science Foundation
- Department of Defense
- Northrop Grumman

Research Interests

- Development of robust, reliable, fail-safe, and fault tolerant UAVs
- Intelligent control of UAVs
- Collaboration between unmanned aerial and ground vehicles
- Robustness of data communication
- Vision guidance system and obstacle avoidance
- Formation flight of UAVs



Expertise

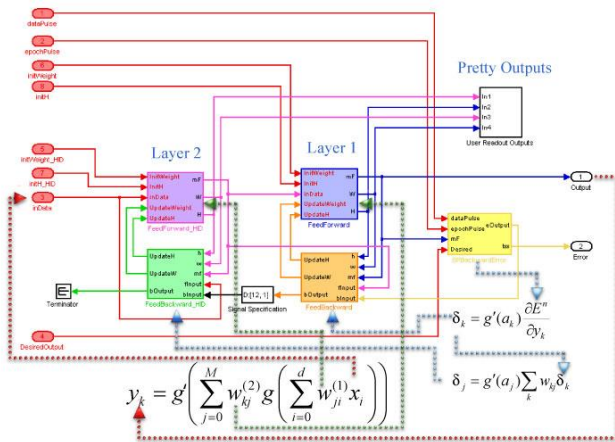
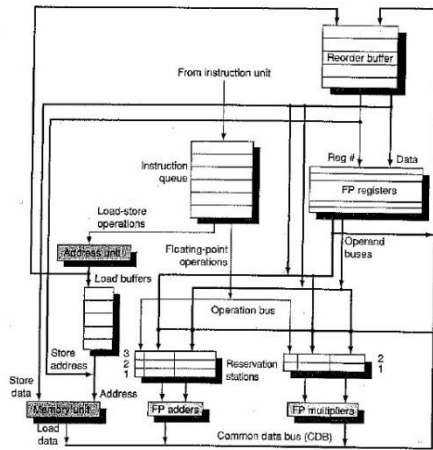
- Computer Architecture
- Embedded System Design
- Real-time Operating Systems
- Artificial Intelligence

Industry & Government Partners

- National Science Foundation
- NASA
- Lockheed Aeronautics
- Fachhochschule, Darmstadt, Germany

Research Interests

- Parallel processing and Out of order execution
- Artificial Intelligence
- Branch prediction
- ARM Cortex M3 based Multitasking system design
- Optimization Techniques
- Numerical Analysis





Expertise

- Traffic safety
- Traffic Operation
- Pedestrian and Bicyclist
- Statistical Modeling

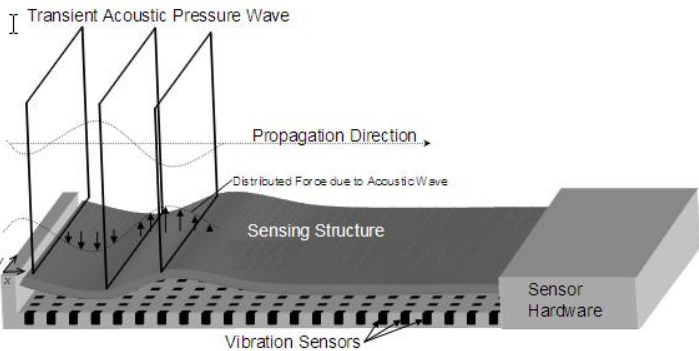
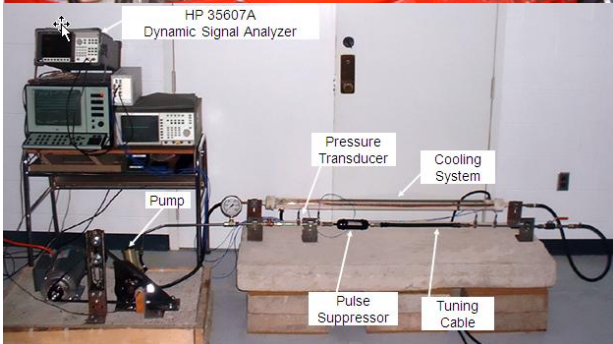
Industry & Government Partners

- Tetra Tech Inc.
- California Office of Traffic Safety
- The City of Glendale



Research Interests

- Highway safety
- Traffic signal design
- Traffic operation
- Transportation planning
- Transportation projects requiring statistical analysis



Expertise

- Noise, Acoustics and Vibration
- Dynamic System Modeling
- Measurements

Industry & Government Partners

- Northrop Grumman, Proctor & Gamble
- Dexen Industries
- National Science Foundation

Research Interests

- Power Steering Noise
- Acoustic Sensor Development
- Noise and Vibration in Fluid Power System
- Novel Pressure Valve Development
- Damping Characteristics of Nano-Materials



Expertise

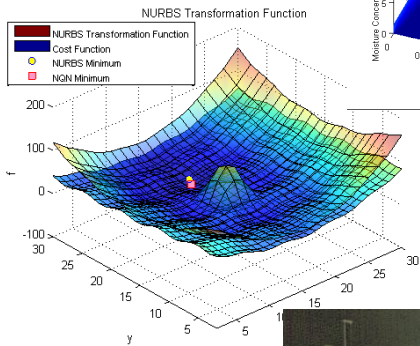
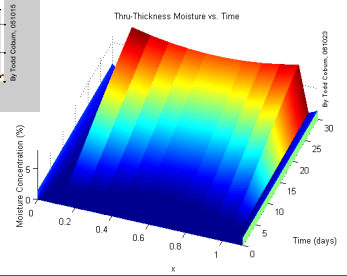
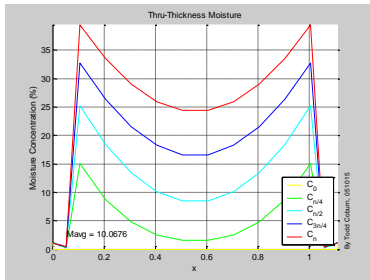
- Aerospace Structural Analysis
- Moisture Absorption of Composites
- Optimization
- Digital Image Processing

Industry & Government Partners

- The Boeing Company
- The Department of the Navy
- Advanced Metals Systems

Research Interests

- Optimization – Constrained & Unconstrained
- Moisture Absorption & Hygro-Thermal Analysis of Composites
- Composite Allowables & Failure Theories
- Powdered Metals Research & Production Systems
 - Advanced Thermal Battery Pellets
 - Near Net Shape Aircraft Parts
- Digital Image Processing
 - Point Cloud Surface Rendering
 - Digital Image Reconstruction





Expertise

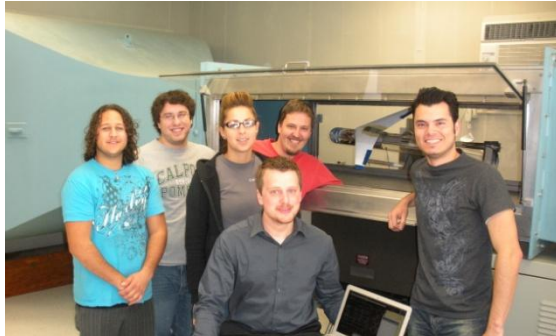
- Aeroelasticity and flutter
- Structural Dynamics and control
- Wind tunnel and flight testing
- Systems Engineering
- Engineering Management

Industry & Government Partners

- Boeing Defense Systems
- LMS International
- Encore Composites
- Alpha Star Corp.
- Saratech Inc.
- NASA LaRC

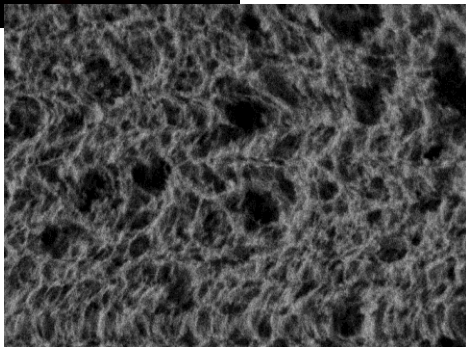
Research Interests

- Development of active-aeroelastic wing maneuver and drag control using composite structures
- Active aircraft gust alleviation and flutter suppression systems
- Wind tunnel test methods for simulation of "free-flight"
- Model Based Systems Engineering and System Architecture simulation development center
- Management of Systems Engineering processes





MgO aerogel



Expertise

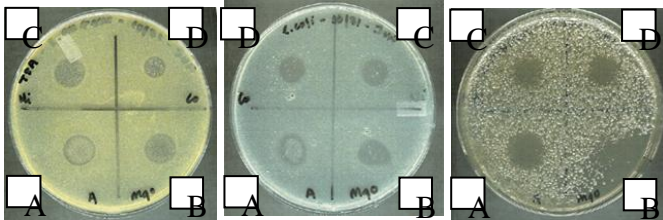
- Bio-composites
- Aerogels
- Energy storage
- Technical Entrepreneurship

Industry & Government Partners

- National Science Foundation
- NASA (JPL and Dryden)
- US Dept. of Education

Research Interests

- Synthesis and characterization of exotic aerogels (high surface area ceramics).
- Materials for batteries, fuel cells, and carbon capture in the energy production process.
- Bio-composite materials for drug delivery.
- Anti-microbial films and coatings.



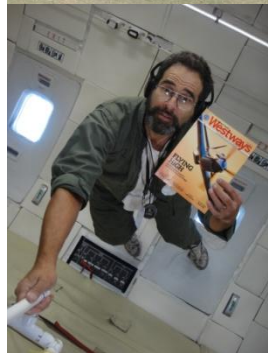
S. aureus (G+ bacterium)

E. coli (G- bacterium)

C. albican (yeast)

Donald Edberg
Aerospace Engineering
909-869-2618
dedberg@csupomona.edu

Donald Edberg
Ph.D.: Stanford



Expertise

- Structural dynamics of vehicles
- Design of aircraft, launch vehicles, spacecraft
- UAV operations

Industry & Government Partners

- NASA
- Jet Propulsion Laboratory
- Northrop Grumman

Research Interests

- Development of low-cost small satellites
- Aircraft & spacecraft trajectory optimization
- Spacecraft stability, control, propulsion systems
- Fixed- and rotary-wing UAVs; high-power rockets
- Structural dynamics & load alleviation/attenuation for flight vehicles
- Reduced-gravity flight testing; high-altitude balloons
- Space history



Expertise

- Sediment transport in river environments
- Urban hydrology and stormwater

Industry & Government Partners

- US Forest Service – Angeles Office
- RBF Consulting
- Colorado State University

Research Interests

- Hydrology/Surface Water
- Stormwater Management
- Flood Control
- River Mechanics
- Sediment Transport



Expertise

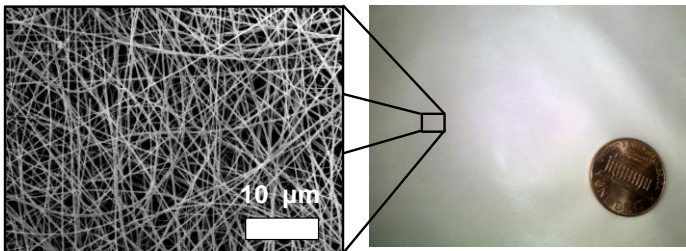
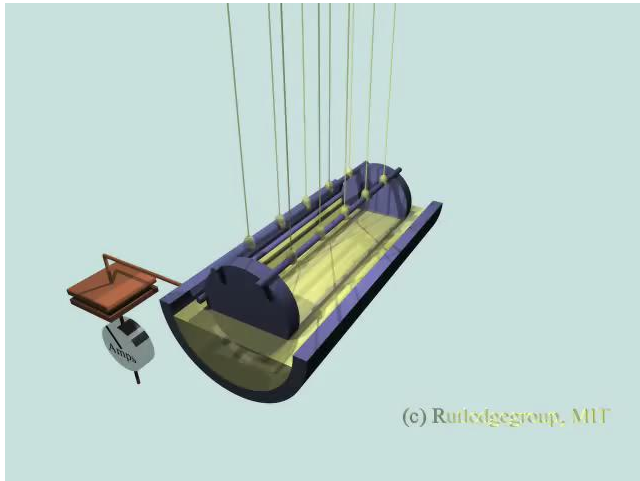
- Applied Electrostatics
- Polymers
- Experimental Design

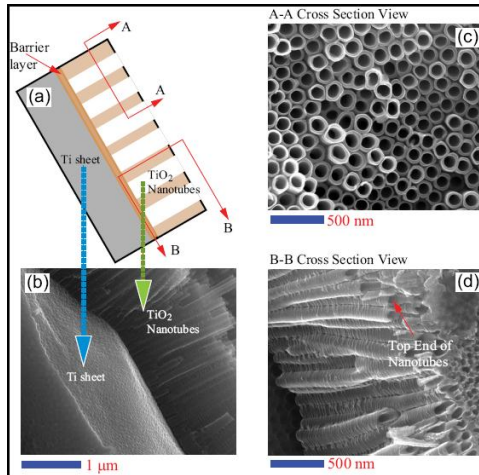
Industry & Government Partners

- The Dow Chemical Company
- Novartis

Research Interests

- Applied electrostatics
 - Electrospinning/ electrospraying
 - Contact charging/ triboelectrification
- , Pharmaceutical manufacturing
 - Downstream operations
- Energy harvesting
- Membrane distillation



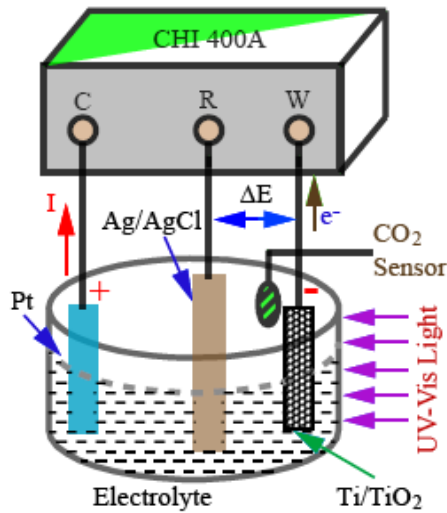


Expertise

- Energy Conversion
- Nanotube Processing
- Photochemical Fuel Cells
- Structure and Mechanics of Materials

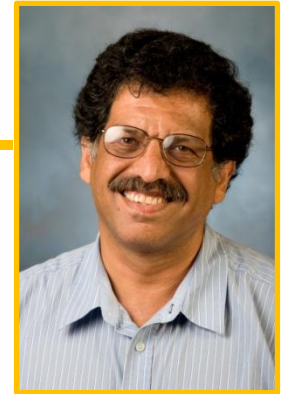
Industry & Government Partners

- Libby Glass Inc.
- NASA
- DOE
- EPA



Research Interests

- Energy Generation with Biophotofuel Cell
- Photovoltaics, Thermoelectric Behavior of Composites
- Strengthening and Toughening of Glasses
- Structural Assessment of Materials
- Energy Conversion System Design
- Fracture, Fatigue and Structural Assessment



Expertise

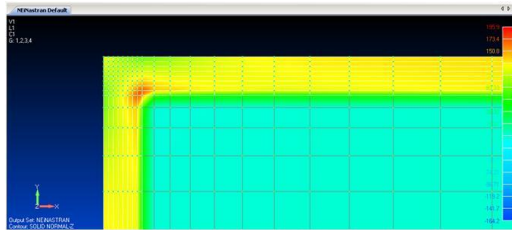
- Mechanics of Materials
- Manufacturing and Failure of Composites
- Failure Analysis
- Machine Safety

Industry & Government Partners

- Heat/Cold Therapy industry
- Aerospace suppliers
- Insurers and Law Firms

Research Interests

- Machine safety/safeguarding of machinery
- Failure and mechanical properties of composites
- Mechanical properties of rapidly prototyped materials
- Thermo-elastic stresses in coatings
- Hybrid Electric Vehicles
- Alternative fuels (ethanol distillation)



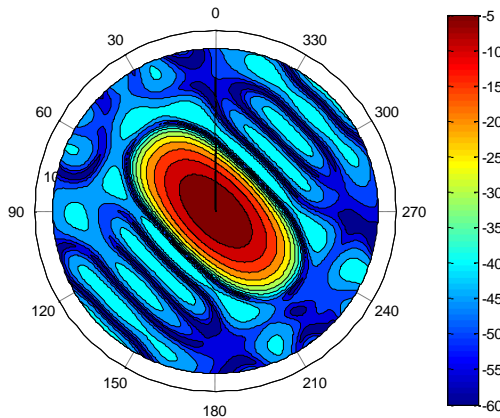
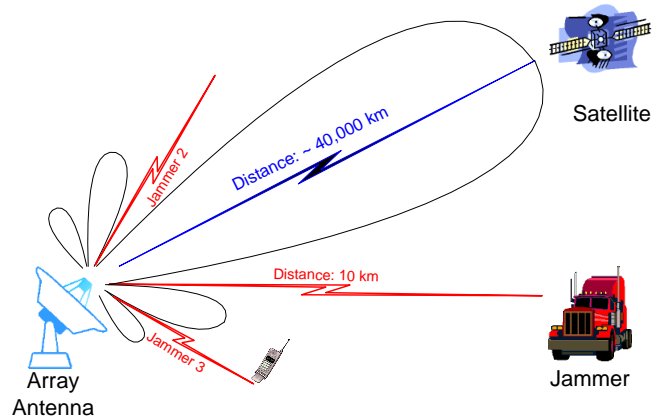


Expertise

- Communication Systems
- Digital Signal Processing
- Radar Systems

Industry & Government Partners

- Raytheon
- Aerospace Corporation



Research Interests

- PI/CoPI for 14 Research Projects with Rockwell, Lockheed Martin and Raytheon
- Independent Consultant for Rockwell, General Dynamics and the Aerospace Corporation
- Over 100 technical and conference papers
- Best paper award for 2 International Conferences
- Taught special classes for Universities in China, Germany and Taiwan
- Taught Adaptive Signal Processing class for the Aerospace Corporation
- Program Recognition Award for outstanding contribution to Wideband Global SATCOM Program from the Aerospace Corporation
- Presented Special Seminar "Model Based Multidimensional Estimation Techniques" to Raytheon. This seminar was broadcasted to all Raytheon sites in US.



Expertise

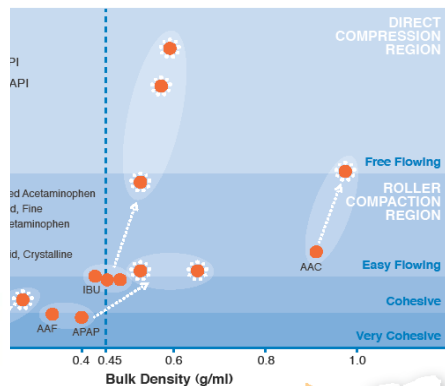
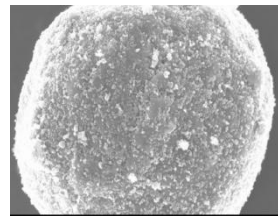
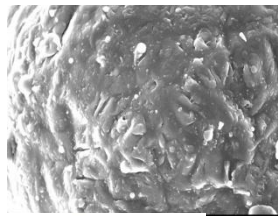
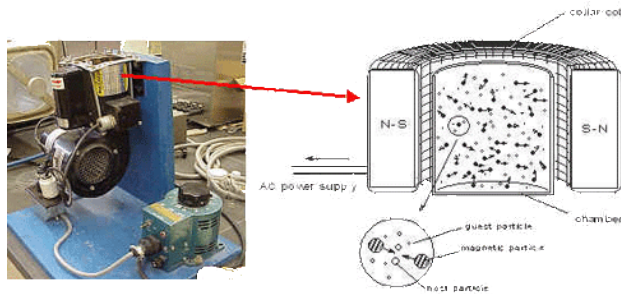
- Particle Engineering
- Surface Interactions
- Materials Characterization

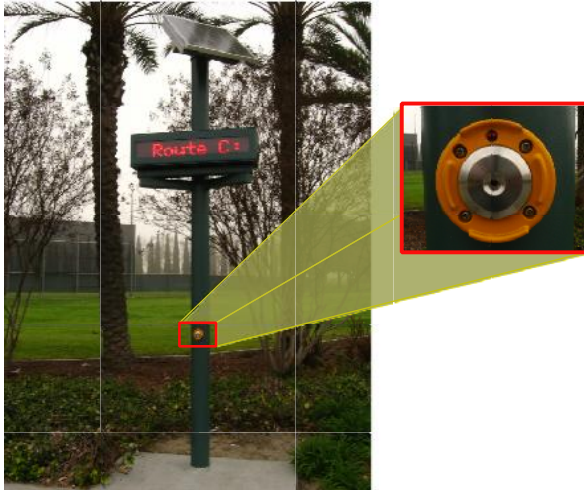
Industry & Government Partners

- National Science Foundation (NSF)

Research Interests

- Particle surface modification and characterization
- Predicting surface coating and mixing using materials properties
- Predicting powder “stickiness” using materials properties
- Particle property effect on adhesion/cohesion forces
- Polymer rheology



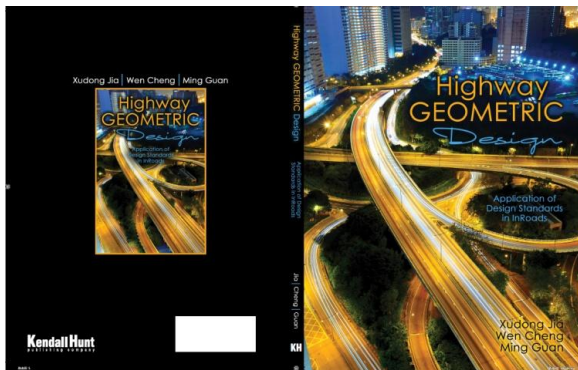


Expertise

- Intelligent Transportation Systems (ITS)
- Design of Transportation Facilities
- Travel Demand Forecasting and Traffic Operation
- Airport Design and Operation
- GPS/GIS Applications in Civil Engineering

Industry & Government Partners

- US Department of Transportation (USDOT)
- California State Department of Transportation (Caltrans)
- University of California Transportation Center (UCTC)
- Los Angeles Metropolitan Transportation Authority (LACMTA)



Research Interests

- Intelligent Transportation Systems (ITS)
- Mobile applications for transportation
- Adaptive traffic control system
- Advanced Public Transportation System (APTS)
- Highway Geometric Design
- Airport Engineering
- Railroad Engineering

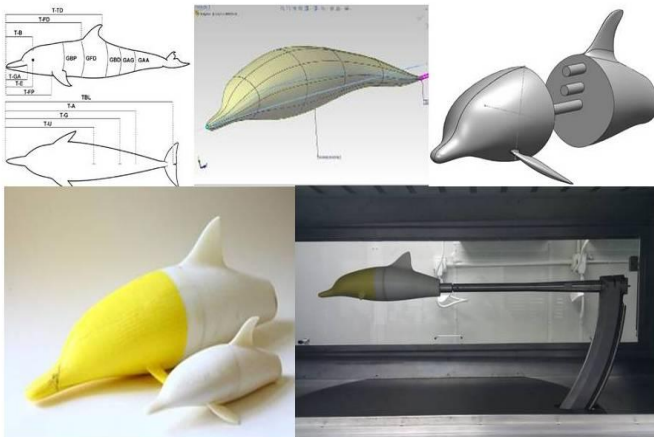


Expertise

- New Product Design
- Mechanism Synthesis
- Engineering Optimization
- Training and Instructional Design

Industry & Government Partners

- National Collegiate Inventors and innovators Alliance
- Motorola
- Northrop Grumman
- National Science Foundation



Research Interests

- Biomimicry and Design
- Sustainable Development
- Design Theory and Methodology
- Assistive Devices
- Educational Robotics

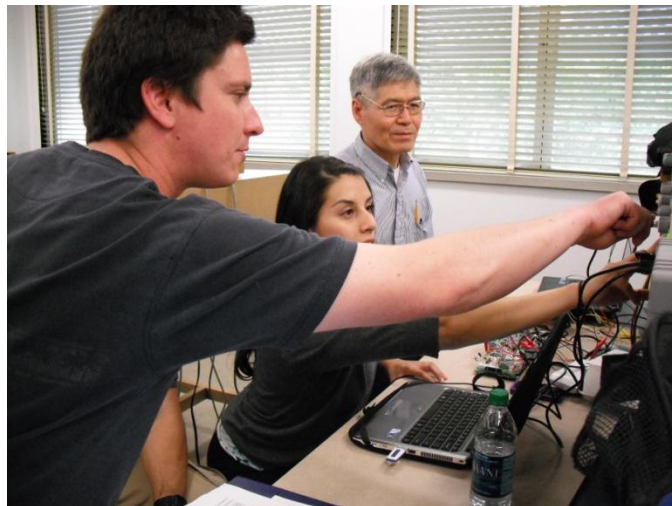


Expertise

- Digital Signal Processing
- Communications, RF, Microwave
- Coding Theory, Data Acquisition

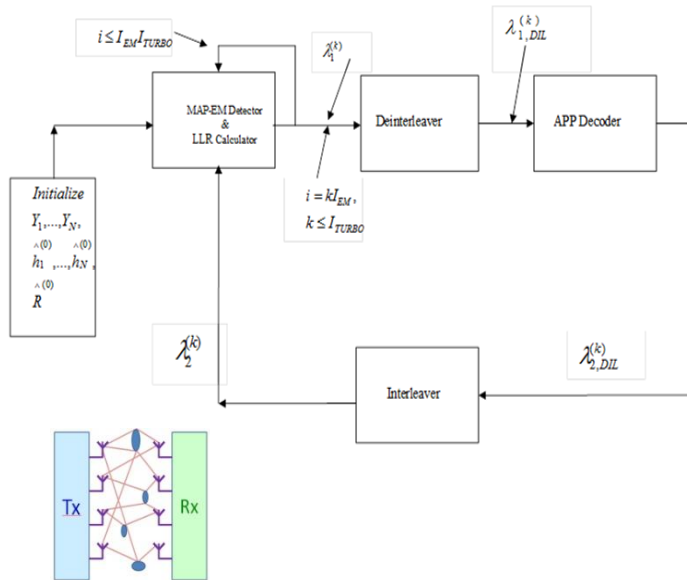
Industry & Government Partners

- Northrop Grumman



Research Interests

- Digital signal processing
- Communications, RF, microwave
- Error correcting codes and source coding
- Data acquisition system design and implementation
- Wireless power transmission system design
- LED driver design, energy harvesting system design

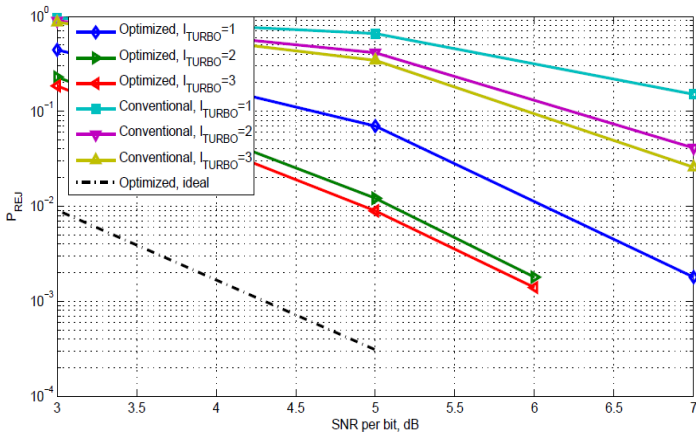


Expertise

- Wireless Communications & DSP
- Iterative Receiver Design
- Data Mining
- Statistical Learning

Industry & Government Partners

- National Science Foundation (NSF)
- Ericson
- University of California, Irvine (UCI)
- University of Minnesota



Research Interests

- Multiple-Input Multiple Output (MIMO) applications with Iterative Reception
- Statistical Learning in network attack detection problems
- Data Mining
- Graph algorithms in receiver design
- Optimized design of experiments
- Sparse Signal Processing



Expertise

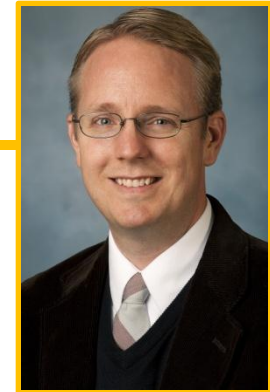
- Geotechnical Applications
- Engineering Education
- Technology Transfer

Industry & Government Partners

- U.S. Dept. of Agriculture
- Department of Defense
- NSF

Research Interests

- Geotechnical Engineering Research
 - Reliability based design in geotechnics
 - Near surface hydraulic conductivity characterization
- Engineering Education Research
 - Effective communications learning
 - Use of on-line teaching methods in hybrid classes
 - Active classroom instruction techniques



Expertise

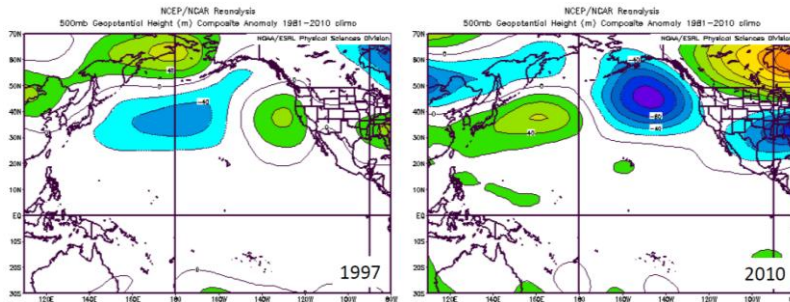
- Hydroclimatology
- Long-Lead Water Supply Forecasting
- Water/Wastewater Hydraulics

Industry & Government Partners

- Parsons Engineering
- U.S. Bureau of Reclamation
- National Weather Service

Research Interests

- Understanding the link between climate variability and water supply
- Generating long lead supply forecasts using data on persistent climate states
- Energy requirements in water and wastewater systems
- Experimental testing of hydraulic devices



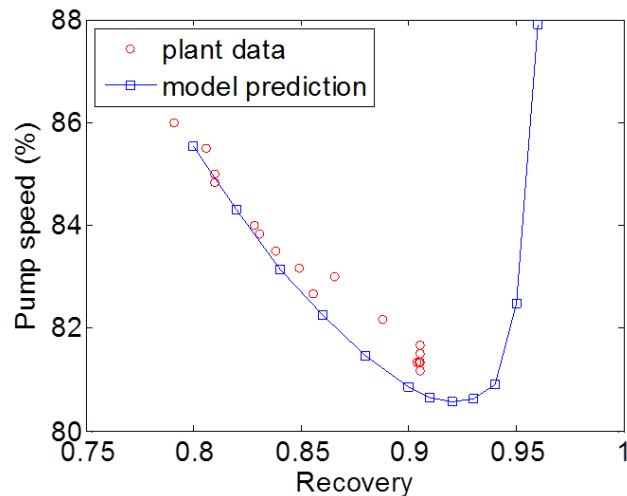


Expertise

- Systems and Control
- Energy Systems Engineering
- Environmental Systems
- Materials Processing

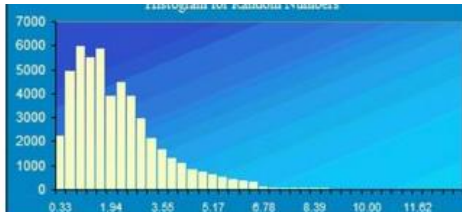
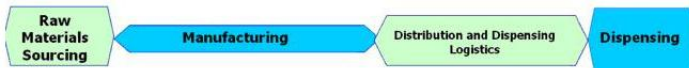
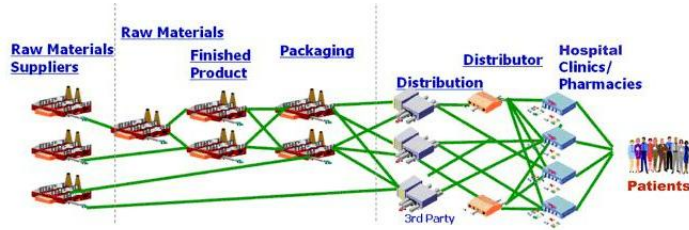
Industry & Government Partners

- Inland Empire Utility Agency
- Intelligent Energy, Inc.
- Zero Emissions Renewable Energy and Biofuels, Inc.



Research Interests

- Energy
 - Hydrogen and fuel cell technology
 - Li-ion battery SoC monitoring and control
 - Low-E coating, TCO and thin film photovoltaics
- Environmental
 - Reverse osmosis desalination and water treatment
 - Particulate processes, CO₂ adsorption, air quality control
 - Self cleaning coating
- Materials processing
 - Thermal spray coating
 - Chemical vapor deposition



Expertise

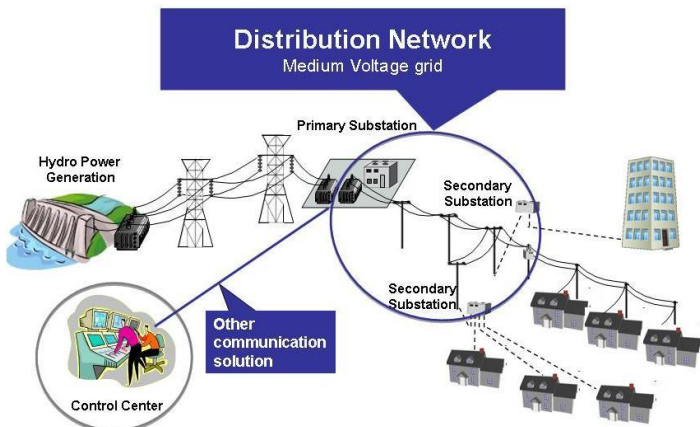
- Optimization
- Transportation & Logistics
- Data mining (Statistical/meta-heuristics)
- Lean and Process Improvement

Industry & Government Partners

- Caterpillar
- CGN & Associates

Research Interests

- Supply chain transportation network modeling
- Rail transportation modeling
- Capacity Management and optimization
- Data mining for customer classification
- Meta-Heuristics problem solving algorithms (Neural network, genetic algorithm, etc)



Expertise

- Power and Energy
- Power Systems Analysis and Design
- Software Engineering
- Operating Systems

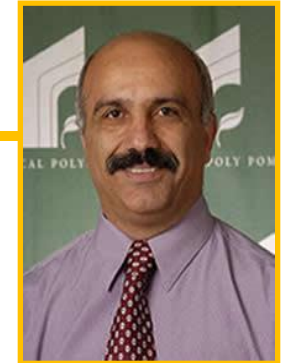
Industry & Government Partners

- Tennessee Valley Authority (TVA)
- NASA/JPL
- National Science Foundation (NSF)
- Southern California Edison (SCE)
- California Energy Commission

Research Interests

- Smart Grid
- Integrated Distribution Management System
- Outage Restoration Management System
- Metering
- Cyber Security
- Software System Engineering & Software Testing
- Fault Tree Analysis





Expertise

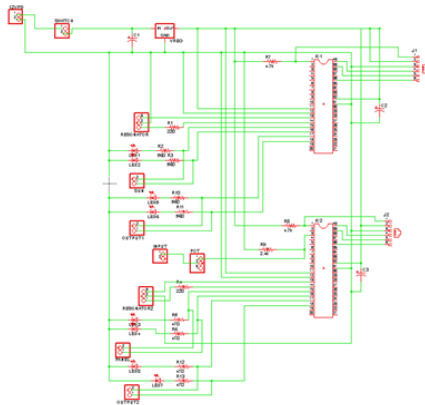
- Photonics and optical communications
- Digital/data communications and networking
- Training/retraining technical workforces
- Solar energy systems (passive & active) design

Industry & Government Partners

- New England Board of Higher Education
- Cooperative Design Technology

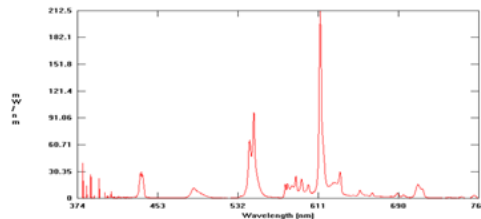
Research Interests

- Lighting systems design
- Light's effect on food products and beverages
- Optical communications
- Optoelectronics devices and systems
- Solar energy/passive and active solar system design

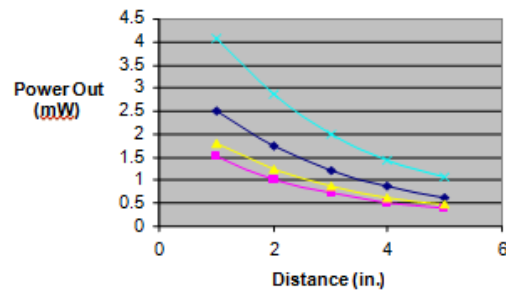


Chromaticity Coordinates [CIE 1931]
x = 0.4084 y = 0.4097
z = 0.1782 u = 0.3534
Correlated Color Temp. [K] = 2428

Spectral Flux



Radiant flux: 2927.34 mW
Luminous flux: 956.957 lum



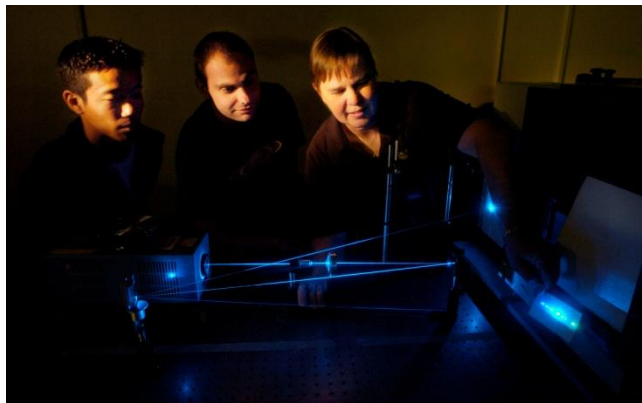


Expertise

- Design of Self-Organizing Real-Time Systems
- Photonics
- Solid-State Lasers

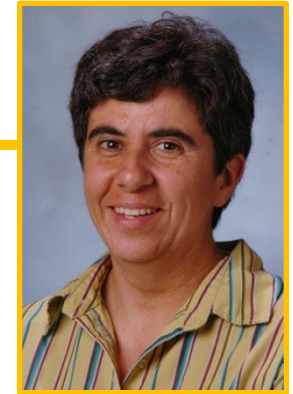
Industry & Government Partners

- The Aerospace Corporation



Research Interests

- Systems engineering of complex systems
- Self-modeling, self-optimization, and self-organization in real-time, multi-agent systems
- Model-based design
- Photonic components and systems
- LED lighting
- Solid-state lasers
- Optical upconversion



Expertise

- 3D modeling
- Airborne and Spaceborne Imagery
- Mapping

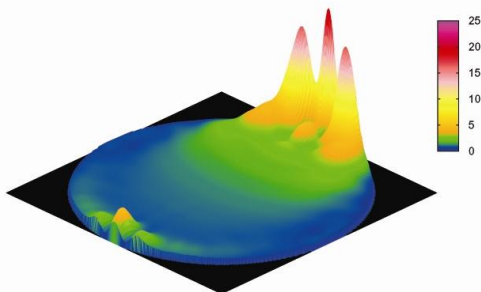
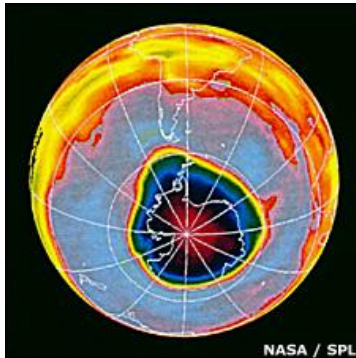
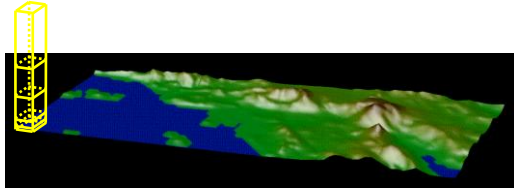
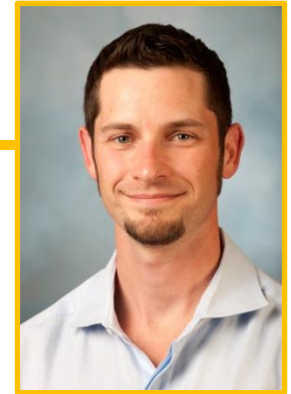
Industry & Government Partners

- California Land Surveyors Association
- Department of Defense

Research Interests

- 3D Visualization, Animation and Simulation
- Fly-Through in the Defense of Territory
- Preservation of Cultural Heritage Sites
- 3D Models of Archeological Sites
- Spatial Reasoning in Student Learning





Expertise

- Computer Modeling
- Chemical & Physical Processes in the Atmosphere
- Technology in education

Industry & Government Partners

- Environmental Protection Agency
- California Air Resources Board

Research Interests

- Formation of bromine from sea-salt aerosols
- Emission rate of CFC replacement compounds in California
- Computer modeling of atmospherically relevant systems
- Calculating light intensity distributions within liquid droplets



Expertise

- Metal Casting Processes
- Investment Casting
- Design for Manufacturing
- Lean Manufacturing and Efficiency

Industry & Government Partners

- Department of Defense
- California Air Resources Board
- Metal Casting Societies and Companies



Research Interests

- New process development and improvement in metal casting
- Efficiency improvement and pollution reduction of manufacturing processes
- Investment casting ceramics
- Design for manufacturing
- Dimensional control of castings



Expertise

- Corrosion Engineering
- K-12 and Postsecondary STEM Pipeline Enhancement

Industry & Government Partners

- NASA Kennedy Space Center
- Boeing
- Sempra Energy



Research Interests

- Materials Testing
- Coatings Evaluation
- Corrosion in Coastal Environments
- STEM Pipeline Enhancement Programs
- Leadership Development



Expertise

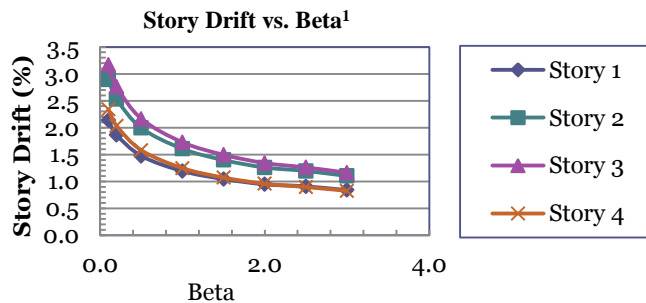
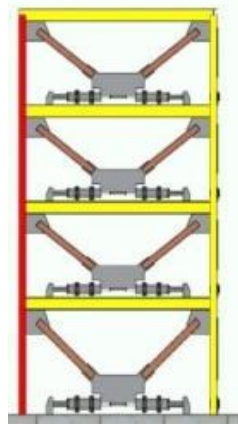
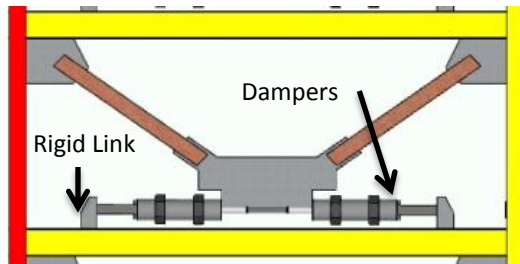
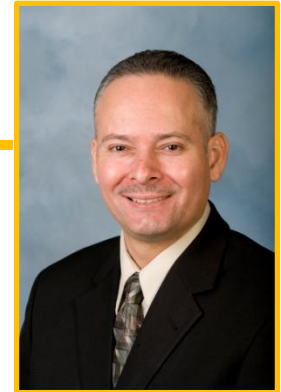
- Water and wastewater treatment
- Water quality
- Soil remediation
- Water education

Industry & Government Partners

- National Science Foundation
- Environmental Protection Agency
- Inland Empire Utilities Agency

Research Interests

- Application of natural treatment systems
- Mobility and bioavailability of contaminants present in soil systems
- Sustainable engineering practices



Expertise

- Seismic analysis and design
- Building structures
- Precast/Prestressed concrete structures
- Unbonded post-tensioned structures
- Structural testing

Industry & Government Partners

- National Science Foundation

Research Interests

- Analytical and experimental lateral load response of structures
- Seismic analysis and design of precast/prestressed concrete structures
- Seismic analysis and design of steel structures with passive damping



Expertise

- Robotics/Telerobotics
- Biorobotics/Haptics
- Control Systems

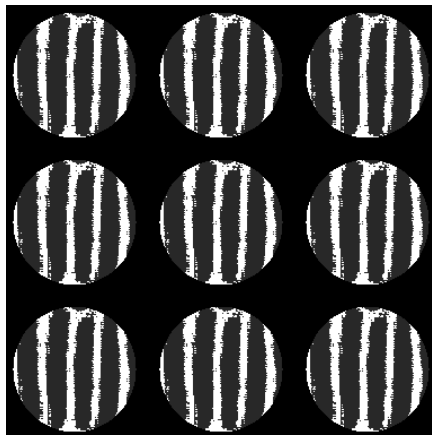
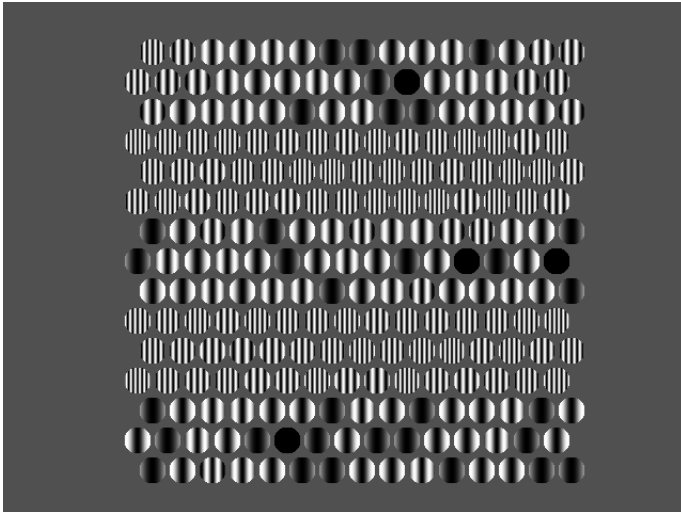
Industry & Government Partners

- National Science Foundation
- Casa Colina Centers for Rehabilitation
- Center for Assistive, Rehabilitation and Robotics Technologies (CARRT), University of South Florida



Research Interests

- Application of Robotics/Haptics in Rehabilitation Engineering
- Design of Assistive Technology
- Integration of Fuzzy Logic and Neural Networks Methods with a Haptic Device for Motor Skills Assessment/Rehabilitation purposes
- Development of a Teaching/Research Multidisciplinary Control Systems Laboratory for the College of Engineering
- Control Systems for Unmanned Aerial Vehicles (UAVs)



Expertise

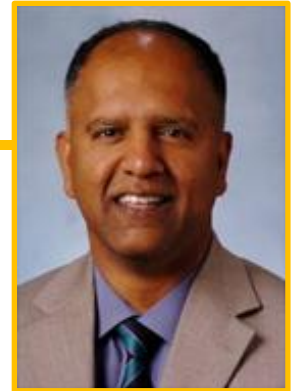
- Solid Mechanics
- Finite Element Analysis
- Experimental Mechanics of Solids
 - Optical Methods for Stress Analysis
- Mechanical Design

Industry & Government Partners

- Department of Defense
- Army
- Oil and Gas Industries

Research Interests

- Stresses in electronic chips and wafers caused by fabrication processes and operation conditions
- Development of a smart sensor that measures pressures in fluid flow, recognizes spatial and temporal patterns, generates signals to stabilize desired flow pattern
- Neural Networks
- Elastic and inelastic behavior of materials
- Minimum weight structural design
- Finite Element Modeling of composite materials



Expertise

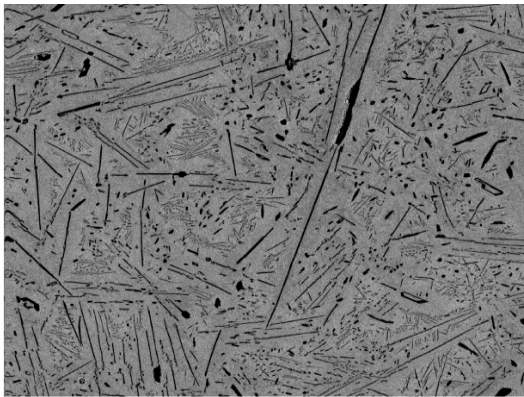
- Metallurgy /Corrosion/Coatings
- Ceramics/Composites/Thermo-electrics
- Polymers/natural materials

Industry & Government Partners

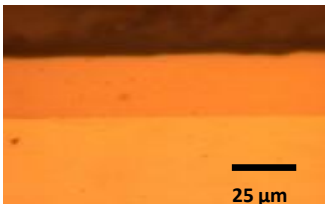
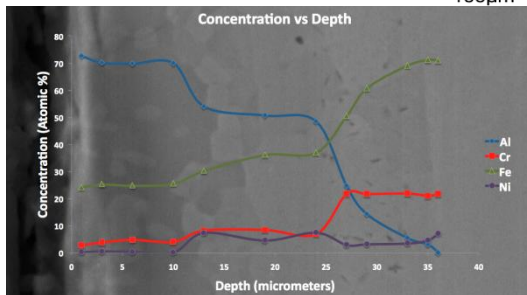
- UCLA/ National Science Foundation
- Ameron International
- UND/Department of Energy
- OakRidge National Lab/Department of Energy
- NASA
- Intelligent Energy

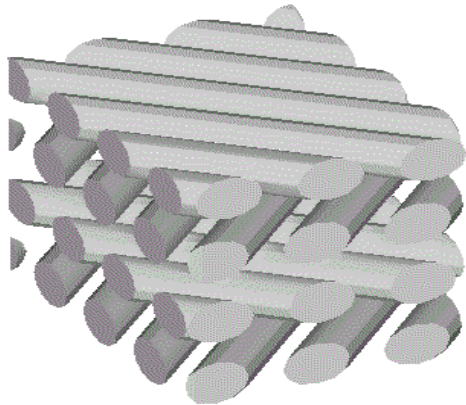
Research Interests

- High Temperature Coatings
 - Development of corrosion-resistant, and superhard coatings
 - Coatings for energy applications
- Aqueous corrosion of biomedical alloys
- Development of ceramic matrix composites
- Natural adhesives
- Spider silk – mechanical properties



100µm



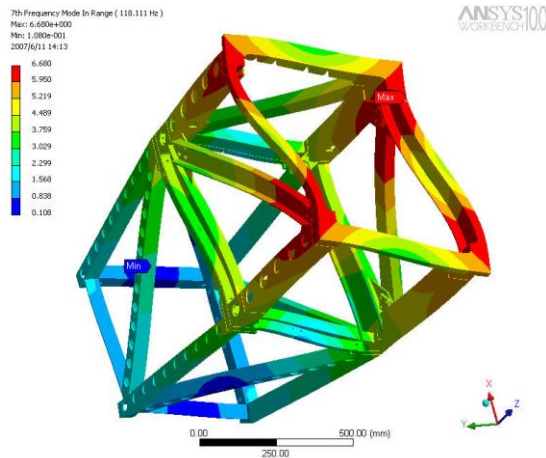


Expertise

- Composites
- Vibrations
- Structural Dynamics

Industry & Government Partners

- Toyota Motor Corporation
- National Science Foundation

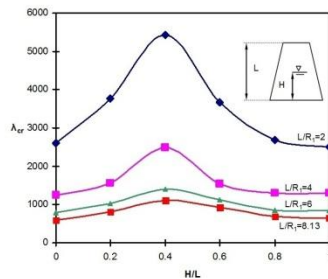
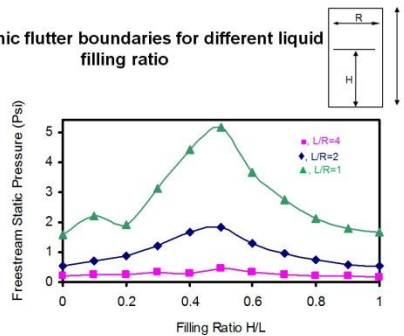


Research Interests

- Engineering Education
- Composites
- Vibrations and Design



Supersonic flutter boundaries for different liquid filling ratio



Expertise

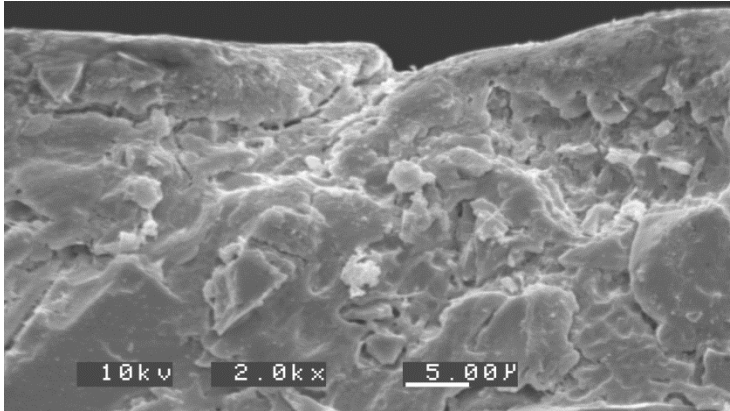
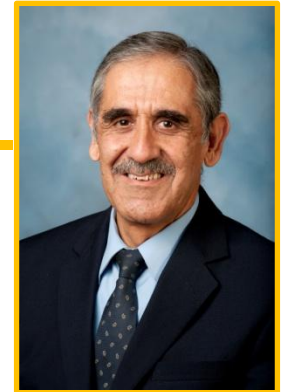
- Aeroelasticity
- Finite Element Analysis
- Fluid-Structure Interaction

Industry & Government Partners

- National Science Foundation
- NASA
- Department of Defense

Research Interests

- Aeroelasticity/Fluid-Structure Interaction
- Design/Analysis of Lightweight Airframe Structures
- Structural Dynamics
- Modeling, Characterization, and Analysis of Morphing Aerospace Vehicles
- MDO

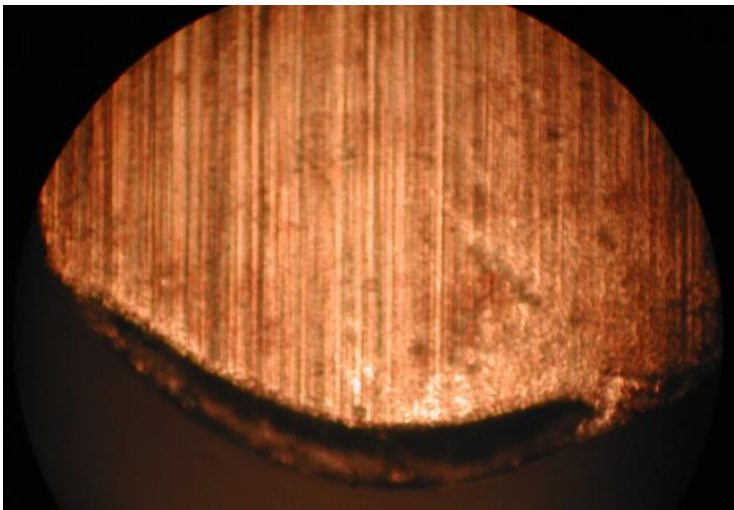


Expertise

- Surface Integrity in Machining
- Composites Machining
- Tool Wear Analysis

Industry & Government Partners

- National Science Foundation
- Texas Instrument



Research Interests

- Surface damage studies of metals due to machining
- Delamination studies of polymers in machining
- Surface damage studies of metal matrix composites caused by machining
- Tool wear analysis when machining traditional and nontraditional materials
- Micro and Nano-machining of metals for miniaturized devices



Expertise

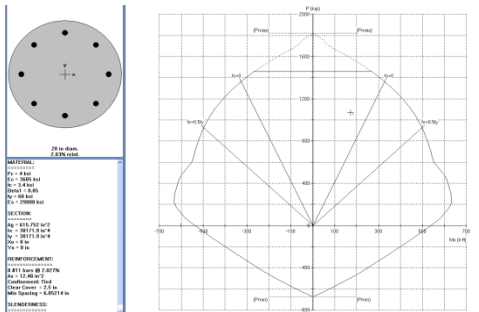
- Earthquake Engineering
- Structural Dynamics & Vibration
- Seismic Assessment and Retrofit of Structures

Industry & Government Partners

- ExxonMobil
- ConocoPhillips
- Fluor Corporations
- Parsons

Research Interests

- Seismic rehabilitation of existing structures
- Design of Structural with energy dissipation devices
- Applications of Performance Based Design (PBD)
- Risk assessment and reliability of existing structures due to seismic loads



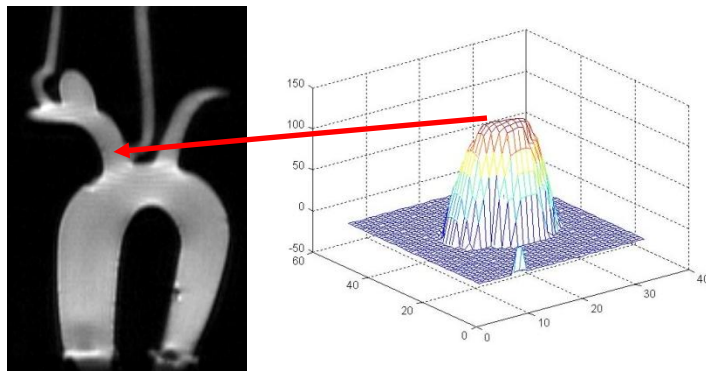


Expertise

- Hemodynamics
- Intravascular Implant Devices
- Vascular Modeling
- Medical Image Analysis

Industry & Government Partners

- National Institutes of Health
- American Heart Association



Research Interests

- Compliant silicone vascular modeling
- Rapid prototyping technique
- Phase-contrast Magnetic Resonance (MR) flow experiment
- Particle image velocimetry (PIV)
- Medical image analysis - X-ray and CT Angiography, and MRI
- Minimally invasive surgery



Expertise

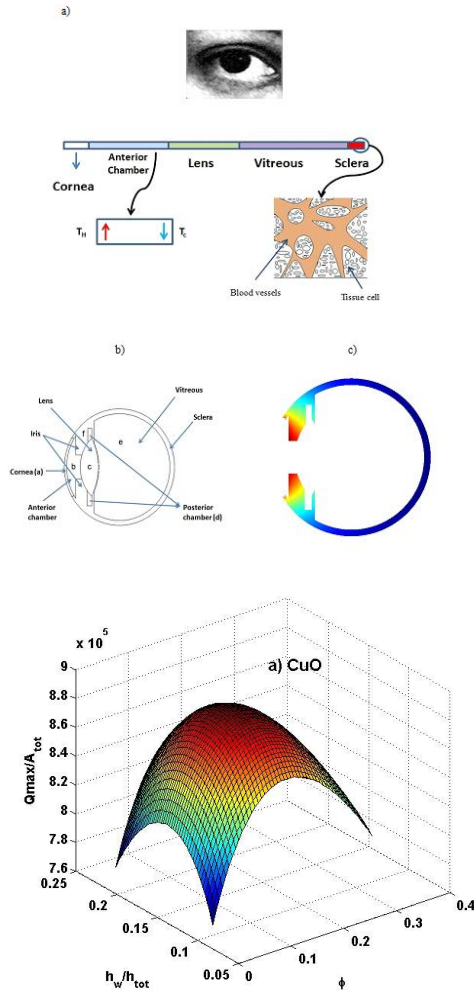
- Thermal/fluid sciences
- Transport in porous media
- Modeling of Biofilm Applications

Industry & Government Partners

- AR Tech (aerospace Manufactures)
- NIH, NSF

Research Interests

- Aquaponics
- Drug Delivery
- Bioheat
- Nano Fluid Heat Pipes





Expertise

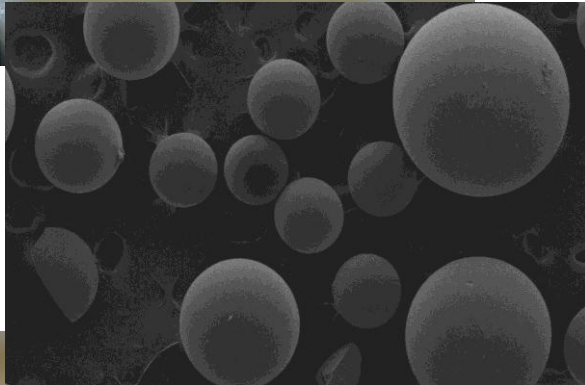
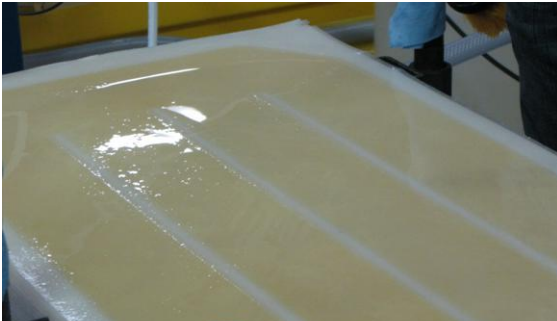
- Drinking Water Treatment
- Desalination Processes
- Sustainability

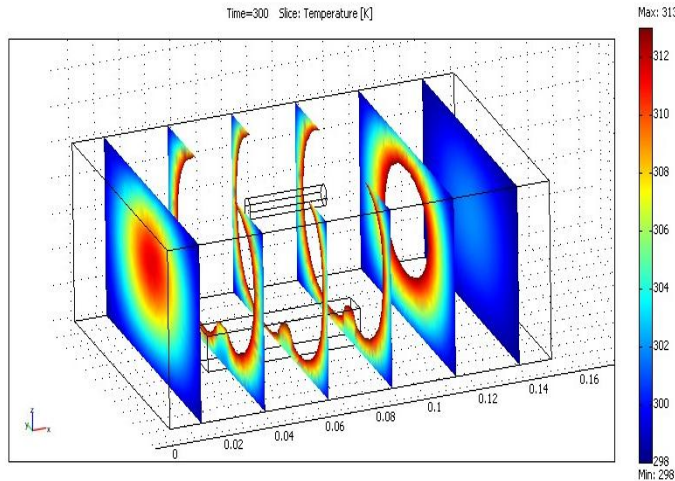
Industry & Government Partners

- Bureau of Reclamation
- Department of Agriculture
- GE

Research Interests

- Perchlorate, Nitrate, Chromium, and Arsenic Removal
- Membrane Processes
- Ion Exchange Applications
- Sea Water and Brackish Water Desalination
- Reverse Osmosis and Electrodialysis Reversal
- Environmental Remediation
- Water Sustainability





Expertise

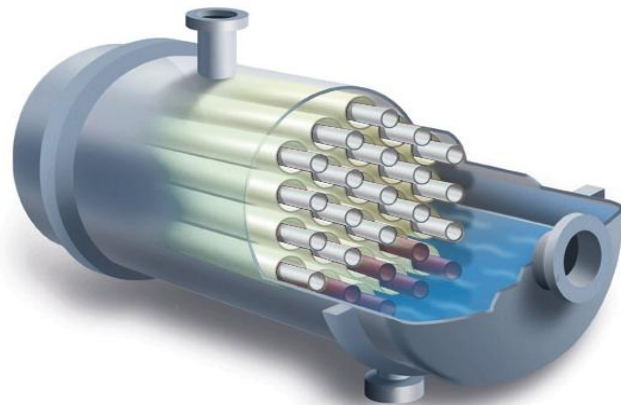
- Fluid Mechanics
- Heat Transfer
- Renewable Energy

Industry & Government Partners

- Jet Propulsion Laboratory
- Dexeon Industries
- Cryoquip

Research Interests

- Electronic Cooling
- Solar Appliances
- Renewable Energy Applications
- Wild Fire Warning/Prevention Applications
- Use of Video Gaming in Teaching Engineering





Expertise

- Industrial Automation
- Industrial Power Systems Analysis and Design, PE
- Illumination Engineering
- Instrumentation and Sensors

Industry & Government Partners

- National Science Foundation
- California Energy Commission
- Southern California Edison
- Boeing Corp.

Research Interests

- Industrial Instrumentation/Sensors
- Biomedical instrumentation
- Illumination
- Sensor Characterization
- Equipment Failure Analysis



Expertise

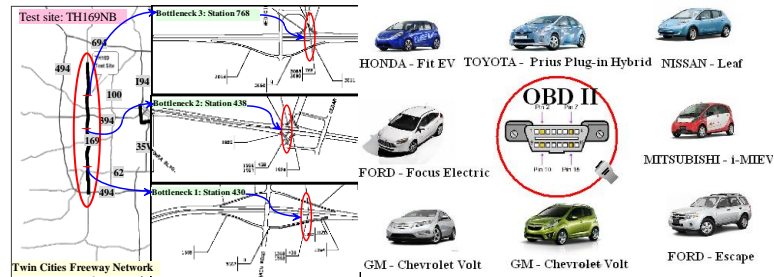
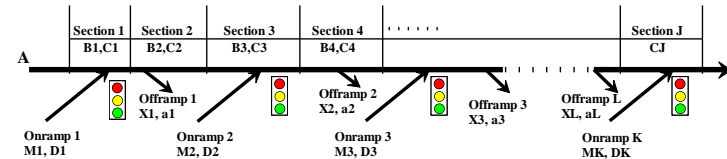
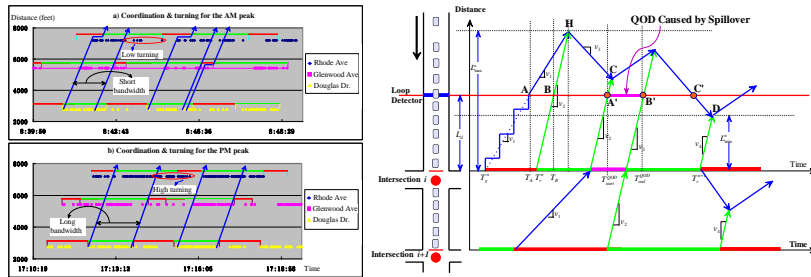
- Urban Traffic Operations
- Network Transportation Modeling
- Transportation System Control
- Intelligent Transportation Systems
- Sustainable Transportation Systems

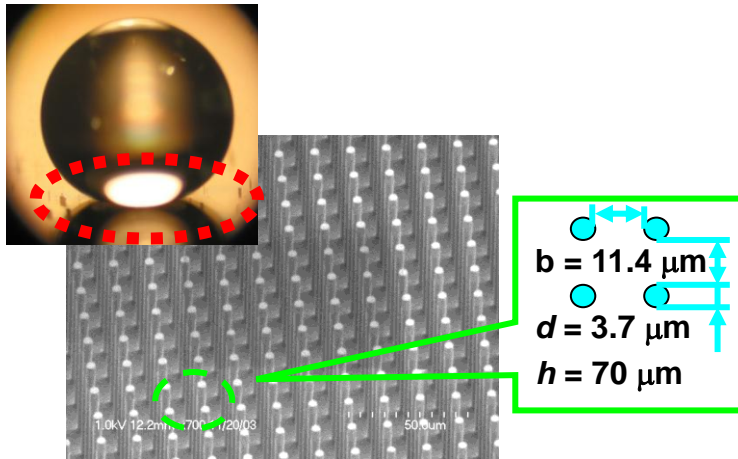
Industry & Government Partners

- California Department of Transportation (CalTrans)
- University of Transportation Center (UTC)
- National Cooperative Highway Research Program (NCHRP)
- National Science Foundation (NSF)

Research Interests

- Large Scale Transportation Data Collection
- Urban Traffic Signal Control
- Traffic Flow Theory
- Freeway Ramp Control
- Driving Behavior Study
- Traffic Collision Avoidance System
- Energy Consumption of Electric Vehicles
- Vehicle Emissions Data Collection
- Advanced Transportation Technologies Applications





Superhydrophobic Surface Design



(a) $\sigma = 0.45$

(b) $\sigma = 0.7$

(c) $\sigma = 1.0$

Micro Thermal Photovoltaic Power Generation

Expertise

- Building HVAC and Energy System
- Micro/Nano Fluid Flow & Heat Transfer
- Computational Fluid Dynamics

Industry & Government Partners

- Dexen Industries, Falcon Waterfree Technologies
- California Energy Commission/Irvine Ranch Water District
- National Science Foundation/NIST

Research Interests

- Microscale fluidics modeling and applications in mechanical, medical device and biotechnologies
- Renewable energy system & thermal analysis
- Green building HVAC system design
- Real-time anomaly detection engine for mechanical system
- Natural gas regulator design and analysis



Expertise

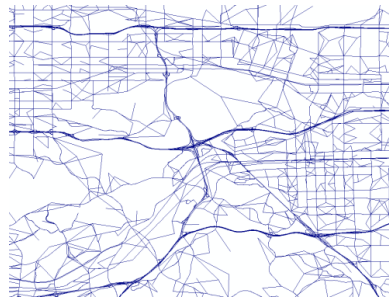
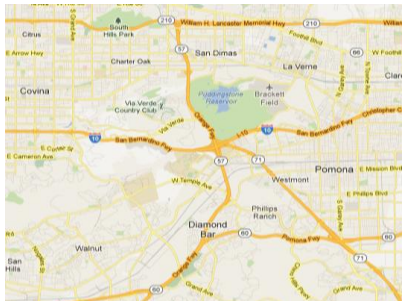
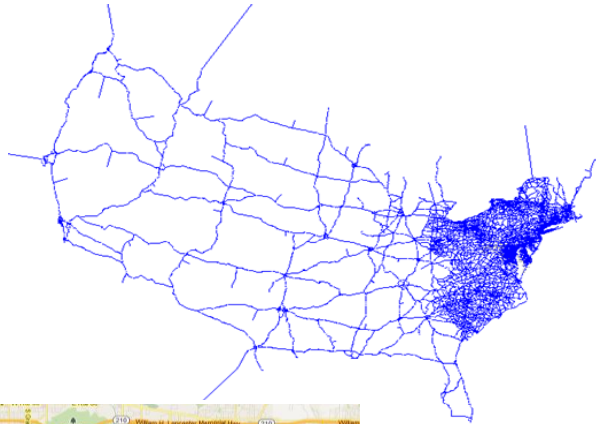
- Travel Demand Modeling
- Transportation Planning

Industry & Government Partners

- Southern California Association of Governments (SCAG)
- Resource System Group (RSG), Inc.

Research Interests

- Econometric modeling of time use, activity and travel behaviors
- Development and application of activity-based travel demand model
- Statistical and econometric modeling methods
- Land use and transportation interactions
- Mobile-phone-based travel survey



College of Engineering

▪ **Mission Statement**

The mission of the Cal Poly Pomona College of Engineering is to produce well-qualified engineering graduates who are ready for immediate and productive entry into the workforce or for graduate studies. The college does so by providing practice-oriented education based on sound engineering principles and applications, while also emphasizing the teamwork, communication and creative skills needed to be leaders in a global society.

▪ **Vision Statement**

The Cal Poly Pomona College of Engineering strives to be a leader in providing relevant and rigorous engineering education in a learning-centered environment. As such, the college endeavors to offer programs and curricula that are up-to-date, globally competitive, and supported by strong ties to educational and industrial partners, while maintaining a community of students, staff, and faculty who are talented, successful, and reflect the diversity of California.

Research and innovation at Cal Poly Pomona would not be possible without partnership and support from industry, government, and our alumni.

There are many opportunities for collaboration with Cal Poly Pomona, and access to research facilities and laboratories in the College of Engineering.

To find out more contact:

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