Student AIMS^2 Research Symposium

ATTRACT, INSPIRE, MENTOR, AND SUPPORT STUDENTS

12NOV2015
3:00 - 6:00 p.m.

HSI STEM Grant Program

CSUN

COLLEGE OF
ENGINEERING AND
COMPUTER SCIENCE

AIMS^2

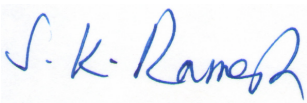
ATTRACT, INSPIRE, MENTOR, AND SUPPORT STUDENTS

The AIMS^2 program is a collaborative grant between the College of Engineering and Computer Science at CSUN, Glendale Community College, and the College of the Canyons and is supported through a five year, $5.5 million grant under the HSI-STEM Initiative from the US Department of Education. The program led by Dean Ramesh and faculty and staff from the partner institutions has made huge strides to address the academic needs of over 200 students, that includes proactive academic advisement and tracking, organized tutoring, peer and faculty mentoring, hands on research opportunities and project based learning, career advising and eventual transition to the workforce or advanced studies. Students in the cohort are supported with stipends to motivate and inspire them to succeed. The program has been nationally recognized by Excelencia in Education (2014), and as a Bright Spot in Hispanic Education (2015) by the White House Initiative for Educational Excellence for Hispanics for its success in retention and improved graduation of Latino/a students and under-represented minorities in engineering and computer science.

Dean's Message

I am delighted to welcome all of you to the inaugural AIMS^2 Student Research Symposium at CSUN supported through a collaborative grant under the HSI-STEM Initiative from the US Department of Education. Hard to believe how far we have come in just four years! Thinking as engineers and scientists we began by doing what is necessary, moving on to what we are able, and here we are four years later seemingly doing the impossible! Students in the AIMS^2 cohorts are supported and mentored by our outstanding faculty through numerous "hands-on" learning experiences. Our data clearly reveals that participation in undergraduate research projects connects students to their disciplines and builds career capital and practical skills marketable in their future careers. One of our students said it best: "Research has made me look differently at myself, what I can do and where I can go with what I am learning." The unmistakable pride, commitment, and dedication of the faculty, staff and students in the AIMS^2 program are a testament to the program's continued success.

It is great that you get to see and hear firsthand from our outstanding AIMS^2 students. I am sure you will be impressed with the diversity and quality of their work!



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Civil Engineering & Construction Management

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Manufacturing Systems Engineering & Management

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Electrical & Computer Engineering

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PI, CSUN

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Dean
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Professor, Department of Manufacturing
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JAN SWINTON
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Glendale Community College

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Glendale Community College

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AIMS^2 STUDENT RESEARCH SYMPOSIUM

November 12, 2015
3:00 - 6:00 p.m.
CR & Ila Johnson Engineering Auditorium

RESEARCH PROJECTS

CIVIL ENGINEERING & CONSTRUCTION MANAGEMENT

- Cost Estimating Model of Construction of Marine Outfalls

COMPUTER SCIENCE

- CSUN Campus Navigation Mobile Prototype
- HSI Web-Portal

ELECTRICAL & COMPUTER ENGINEERING

- Design and Implementation of Dual-Axis Solar Tracking System

MANUFACTURING SYSTEMS ENGINEERING & MANAGEMENT

- Electrochemical Testing of Biosensors
- Active Materials and Morphing Structures
- Additive Manufacturing Process for Metallic Components

MECHANICAL ENGINEERING

- Mechanical Loading of Anatomic Human Foot using Finite Element Analysis
- Designing Hydrogen Bubble Flow Visualization for Aerodynamics Experiments
- Experimental Study of Thin and Thick Airfoils at Low Reynolds Numbers

Interdisciplinary
COMPUTER SCIENCE, ELECTRICAL ENGINEERING, & MECHANICAL ENGINEERING

- Learning by Building: Design and Construction of Autonomous Drones

FACULTY MENTORS

Dr. Anwar Alroomi
Dr. Sami Maalouf

RESEARCH ASSISTANTS

Fladio Godines
Tadis Gourehzar
Gagik Nazaryan
Cynthia Sarkissian

Cost Estimating Model of Construction of Marine Outfalls

Project Description: This research provides information on costs associated with the construction of marine outfalls. Engineers who are involved in estimating these costs require reliable data that enable them to make adequate budgeting decisions. Outfall parameters and characteristics affecting construction cost are addressed. In addition, a model derived from such characteristics is presented to help facilitate future cost decision-making. Information on numerous recent projects of such nature is also summarized in this study.

CSUN Campus Navigation Mobile Prototype

FACULTY MENTOR

Dr. Gloria Melara

RESEARCH ASSISTANTS

Luis Gomez
Ernie Ledezma
Shiyin Li, GCC
Jesus Moran Perez
Dani Odicho
Paulo Osuna
Hovig Tchagaspanian
Jean Villanueva, GCC

Project Description: Pragmatic experience on a mobile application. The fundamentals on mobile APIs through a design and implementation of "CSUN guide" mobile API. The goal of the project is to have an application to help people with impaired eyesight to get around school campus. *Educational objectives:* Give students experience on design, teamwork collaboration, NP algorithms, and critical thinking skills that were used on the design and implementation of the mobile API.

HSI Web-Portal

FACULTY MENTOR

Dr. Gloria Melara

RESEARCH ASSISTANTS

Paulo Osuna
Edwin Salazar
Tatevik Sardaryan

Project Description: The purpose is the research on web technology and user experience to design and implement a website to serve as a communication link among HSI-STEM grantees. Goal to have a website that dynamically shows the location of PI; provide a repository for the proposal, best practices, searching capabilities and real-time communication among the grantees. *Educational objectives:* Give students experience on a project from conception to deployment of the product. The students have applied agile methodology and practiced concepts of user experience to design and implement the application.

FACULTY MENTOR

Prof. Bruno Osorno

RESEARCH ASSISTANTS

Gary Arzumanyan
Diego Campos
Francis A. Cuevas
Catherine Hartnek
Sarkis Semerjian
Ninsina Yadkar

Design and Implementation of Dual-Axis Solar Tracking System

Project Description: We are working on the design and implementation of mobile-single panel dual-axis solar tracking system using an "arduino" microcontroller. We have all of our AIMS^2 students involved in this project. Four of them are also using this project as their senior design project. We are dealing with current, wind, irradiation and voltage sensors, interfacing with a touch LCD screen. Also, we are programing the microprocessor to track the position of the sun at any given time. The final stage of this project will be to have an "app" in an android or iphone that will control the tracker and have the ability to read the voltage, current and power output. Once this system is operational, it will be completely independent from the grid. All power used for the tracking system will be delivered by a storage system (battery).

FACULTY MENTORS

Dr. Behzad Bavarian
Prof. Lisa Reiner

RESEARCH ASSISTANTS

Edith Elyasi
Vaheh Elyasi

Electrochemical Testing of Biosensors

Project Description:
Graphene and sensors are a natural combination, as graphene's large surface-to-volume ratio, excellent electrical conductivity and high carrier mobility make it greatly beneficial for sensor functions. The large surface area enhances the surface loading of desired biomolecules, and excellent conductivity and small band gap can be beneficial for conducting electrons between biomolecules and the electrode surface. The objective of this research project was to make graphene electrodes sensitive enough to measure glucose levels for diabetes patients. Much time went into the research and into microwave irradiation of the graphene to produce high quality graphene sheets. Ultimately the graphene was used to manufacture electrodes, replacing more expensive materials like platinum and gold. Electrode microstructure was examined and multiple electrochemical tests were conducted to evaluate the electrodes. From the electrochemical impedance spectroscopy results, the graphene based electrodes showed increased active surface area and good charge transfer, which will significantly improve its ability to function as a sensor.

FACULTY MENTORS

Dr. Behzad Bavarian
Prof. Lisa Reiner

RESEARCH ASSISTANT

Anna Chilingarian

Active Materials and Morphing Structures

Project Description:
Aerospace engineers have long been searching for a new technology to dramatically reduce fuel consumption and improve control mechanisms. The technology used to design and construct aircraft has seen no dramatic changes in the last 25 to 30 years. Studies support that an aircraft wing designed with morphing, responsive capabilities will offer aircraft flexibility in flight, lighter weight, and improved actuation control. Morphing can enable aircraft to adapt to its environment and make it suitable for many tasks, instead of being limited to a single purpose. Composite materials, electroactive polymers and shape memory polymers are all potential material candidates for morphing aircraft designs. In this study, the research objective was to study piezoelectric actuators that respond to applied voltage by bending or distorting and apply these to the wings of Micro Air Vehicles.

FACULTY MENTORS

Dr. Behzad Bavarian
Prof. Lisa Reiner

RESEARCH ASSISTANT

Navjeevan Sandhu

Additive Manufacturing Process for Metallic Components

Project Description:
At CalRAM, additive manufacturing of metallic components is done using cutting edge electron beam melting (EBM) technology. EBM takes 3D Computer Aided Design (CAD) files as inputs, which are then decomposed into a set of thin, two-dimensional slices. Beam position, spot diameter, and power instructions are generated for each layer, which are then printed by moving the electron beam in the surface of the powder bed. The equipment can create solid metal components directly from a CAD model, ideal for manufacturing molding tools and prototypes. EBM components are created under vacuum, assuring metallurgical purity of the finished part, and the temperatures (700 to 1000˚F) used in the powder bed to promote material consolidation, lead to stress free parts that retain their shape when cooled to room temperature. Additive manufacturing technologies like electron beam melting can deliver parts quickly for aerospace, medical, sporting goods and other industries requiring small batch production.

FACULTY MENTOR

Dr. Vidya Nandikolla

RESEARCH ASSISTANTS

Daniel Hooper
Scott Judge

Mechanical Loading of Anatomic Human Foot using Finite Element Analysis

Project Description: A human foot model is developed and the biomechanical stress distribution is investigated. As foot is the lower extremity of the body, the contact surface area holds the weight of the complete body during activities such as walking, running, climbing etc. The study of the forces acting on the foot is important, as it helps us understand the different types of injuries. A 3D model from CT scans was generated relating the anatomical domains of bones and soft tissues using Comsol Multiphysics software tool. The computational model of the foot structure was utilized to evaluate the distributed vertical ground reaction forces. The contact pressure distributions were generated between the plantar foot area and the ground support for different types of foot depending on the arch height and ankle alignment. Pressure distributions on the foot are dependent on the medial longitudinal arch height, corresponding arch index, the angle of transverse arch rotation, and the elastic properties of the skin, bone, and cartilage. These parameters were used to classify and analyze different types of foot to study the mechanical load distribution.

FACULTY MENTOR

Dr. Vibhav Durgesh

RESEARCH ASSISTANT

Elifalet Garcia

Designing Hydrogen Bubble Flow Visualization for Aerodynamics Experiments

Project Description: We designed a Hydrogen bubble setup and for conducting flow visualization experiments on airfoils at a Reynolds number of less than 50,000 at varying degrees of angle of attack. The in-house Hydrogen bubble facility was developed using high power DC voltage supply, 25µm Platinum wires, 2MP Basler CCD camera, and pulse enerator controlled using LabView program. The flow visualization system designed here is used to identify separation and re-attachment locations on the airfoil at different angles of attack.

FACULTY MENTOR

Dr. Vibhav Durgesh

RESEARCH ASSISTANT

Elifalet Garcia

Experimental Study of Thin and Thick Airfoils at Low Reynolds Numbers

Project Description: The objective of this investigation is to experimentally study the force and moment characteristics of thin and thick airfoils at low Reynolds numbers, as well as to correlate the steady and unsteady flow structures over airfoils with instantaneous load characteristics. To accomplish this, simultaneous force measurements and flow visualization experiments are performed for Reynolds numbers of 20,000, 30,000, and 40,000, and angles of attack between 2° to 12°. All the measurements for this investigation are performed in the low speed flow visualization water tunnel facility at California State University Northridge. Two-component Laser Doppler Velocimetry system is used to quantify inflow parameters prior to each experiment. A 6-axis force/torque transducer is used for performing force and moment measurements, and hydrogen bubble technique is used for flow visualization on the suction side of airfoil. A detailed discussion of aerodynamic load characteristics of the thin and thick airfoils at low-Reynolds numbers, and flow visualization results, is presented.

FACULTY MENTORS

Dr. Gloria Melara
Dr. Vidya Nandikolla

RESEARCH ASSISTANTS

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Anthony Rosales
Delbert Stewart
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Learning by building: design and construction of an autonomous drone

Project Description: The goal of the project is to emphasize on engineering design, innovation, communication, small group collaboration, and critical thinking skills that are required for students to be successful. The multidisciplinary student team consisted of undergraduates from mechanical, electrical, & computer science backgrounds. The main focus was to seamlessly integrate the concepts from different disciplines of engineering into a focused and real-world robotics system. A robot can be a mechanical agent using an electronically operated mechanical machine guided by computer program or electronic circuitry. They can be autonomous, semi-autonomous or remotely controlled. The students worked on designing and building an autonomous drone robotic system for navigation purposes.

The student team developed the design of the drone in-house, researched on the electro-mechanical components, flight control system, mechanical structure, microcontroller programming, and the controlling motors. The integration and communication of the electro-mechanical components are controlled by a raspberry pi. The sub-teams took the lead for the following tasks: mechanical design of the drone, simulation and testing, programming and integration. The drone was designed and programmed to navigate to a certain location. The manufacturing cost of the drone was considered as part of selecting the components.

If you would like to support this outstanding program, please contact the College's Development Office at 818.677.6078.

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Attract Inspire Mentor Support Students

AIMS^2

HSI STEM Grant Program

http://www.ecs.csun.edu/aims2/

Funded by the United States Department of Education FY 2011 Title III, Part F, Hispanic-Serving Institutions (HSI) STEM and Articulation Programs cooperative arrangement development five-year grant. Award Number P031C110031, CFDA Number 84.031