## ME SENIOR DESIGN PROJECT CONFERENCE DAY PRESENTATION SCHEDULE

Instructor: Professor Tai-Ran Hsu  
Location: Engr 192

<table>
<thead>
<tr>
<th>Team Members</th>
<th>Project Title</th>
<th>Sponsor</th>
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<tr>
<td>Ahmad Abudamous</td>
<td>Super ZEM Vehicle</td>
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<td>Cong Cao</td>
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<td>Jimmy Huynh</td>
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<td>Mohammad Deen</td>
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<td>Rohit Lal</td>
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<td>Thom Angelo Sabater</td>
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<td>Reginald Imbat</td>
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<td>Chun Wing Li</td>
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<td>Tyler Mori</td>
<td>RADAGAST: Rover-Based Ascertainment of Disease Afflicted Grapes with Automated</td>
<td>JAI Inc., US Digital, Exatron Inc., Roger Jue</td>
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<td>Fabrice Paccoret</td>
<td>Spectral Tests</td>
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<td>Kurtis Wendling</td>
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<td>Weston Furia</td>
<td>Heavy Load Stair Climber</td>
<td>Shorai Batteries Incorporated</td>
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<td>Ali Basirat</td>
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<td>Eliud Lun, Ryan Oliver</td>
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<td>Raphael Asuncion</td>
<td>High School Auto-Tech Teaching Aid</td>
<td>Independence High School</td>
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<td>Saba Gorji</td>
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<td>Reuben Reyes</td>
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<td>Matt Beauregard</td>
<td>Office Net Zero Energy Evaluation</td>
<td>Salas O’Brien Engineers Inc.</td>
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<td>Evan Sarver</td>
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<td>Virgilio Yasay</td>
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<td>Randy Duong</td>
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<td>James Lovlien</td>
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<td>Aquiles Manuel</td>
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<td>Ruiz Marquez</td>
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<td>Mario Mitchell</td>
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<td>Leroi Baltazar</td>
<td>Vehicle Dynamometer Lab Development</td>
<td>ME185 Lab Development</td>
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<tr>
<td>Kiera Pietrangelo</td>
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<td>Matthew Williams</td>
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<td>Andrew Wong</td>
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<td>Hocheol Yu</td>
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<td>Jorge L. Alvarez</td>
<td>Vehicle Driving Simulator</td>
<td>AS, Renovo Motors</td>
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<td>Jesus Carriedo</td>
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<td>Allen Hermosillo</td>
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<td>Paul Li Lozada</td>
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<td>Vadim Morgunov</td>
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<td>Quyen Tran</td>
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<tr>
<td>Nikolai Cepeda, Ryan Malingaya, Alyssa Ruiz</td>
<td>Two-Dimensional Traverse System for Wind Tunnel Measurements</td>
<td>ME Department</td>
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<tr>
<td>Alan De Lira, Michael Monson, Neel Shah, Kyle Smith, Victor Vargas</td>
<td>Design and Development of a Specialized Consumer Robot</td>
<td>Associated Students, SJSU College of Engineering, ASME FEST Grant</td>
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<td>Timothy Duggan, Jason Ersepke, Francois Labat, Andrea Olivas, Ryan Tsai</td>
<td>Passive Cooling optimization for LED Panels</td>
<td>Hastest Solutions Inc</td>
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<td>Bojin Liang, Abdul Mohsin, Almudares, Hung Nguyen, Ali-Imran Tayeb, Sze Chung Wong</td>
<td>Design and Development of plasma chambers for dusty plasma applications</td>
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<td>Logan Bekker, Derrick Lao,</td>
<td>The Rapid Splitter for Tesla's Wire Harness Assembly</td>
<td>Golden State Assembly</td>
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<td>Alex Mortarotti, Peter Soto</td>
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<td>Joseph Carbone, Stefan Geiger</td>
<td>Omni-directional Cart</td>
<td>Intuitive Surgicals</td>
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<td>Joe Noe, Kade Pourroy,</td>
<td>ASME's CNC Machine</td>
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<td>Fernando Rodriguez, Dylan</td>
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<td>Tait-Mole</td>
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<td>David Cruz, Jordan Hashimoto</td>
<td>Robotics Club - Mars Rover</td>
<td>SJSU Robotics Club</td>
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<td>Alex Moyer, Jim Noe, Giann</td>
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<td>Penalba</td>
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<td>Anthony Bowe, Martin Chavez,</td>
<td>Collapsible Coffee Cup</td>
<td>Dr. Raymond Yee / Jason Blum</td>
<td>10:30</td>
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<td>Ryan Yu</td>
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<td>Sarah Chu, Jack Forney, Lyle</td>
<td>Assistive Bionic Joint - an Augmented Joint Movement Device</td>
<td>Festo, CalRAM, Associated Students &amp; SJSU</td>
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<td>Kosinski, Vincent Nagel</td>
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<td>Matt Stewart, Kent Tran,</td>
<td>Followbud - a robotic cart that follows you around in workshops</td>
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<td>Puyun Yen, Justin Yu</td>
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<td>Thi Ho</td>
<td>Graffiti Removal Robot</td>
<td>City of San Jose/Winncy Du</td>
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<td>Jeungmin Kim</td>
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<td>Vincent Nguyen</td>
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<td>Jordan Coward</td>
<td>Mini-Baja SAE Drive</td>
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<td>Jacob Heth</td>
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<td>Michael Romero</td>
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<td>Charlie Trevaskis</td>
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<td>Wilton Chang</td>
<td>ASHRAE HVAC Competition</td>
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<td>Aditya Mairal</td>
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<td>Austin Stevenson</td>
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<td>Suraj Thapa</td>
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<td>Meshal AlShahrani</td>
<td>Simulated Microgravity Environment</td>
<td>NASA Ames</td>
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<td>Karel Bachand</td>
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<td>Christopher Kackman</td>
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<td>Esai Coss</td>
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<td>Ashkon Baharlou</td>
<td>Automatic Beer Dispenser</td>
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<td>Jose Torres</td>
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<td>Andy Wu</td>
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<td>Jackson Fogelquist</td>
<td>Hybrid Solar/Wind Turbine</td>
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<td>Irma Gutierrez</td>
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<td>Evan Langer</td>
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<td>Alexander Sura</td>
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<td>Michael Kemp</td>
<td>Spartan Superway - Half Scale Bogie</td>
<td>SJSU Associated Students, College of Engineering, Swenson Builders, TechShop San Jose, Bryan Burlingame, Microsoft</td>
<td>9:00</td>
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<td>Jorge Soto</td>
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<td>Randy Castillo</td>
<td>Spartan Superway - Half Scale Braking &amp; Propulsion</td>
<td>SJSU Associated Students, College of Engineering, Swenson Builders, TechShop San Jose, Bryan Burlingame, Microsoft</td>
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<td>Craig Hudacko</td>
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<td>Brean Aquino</td>
<td>Spartan Superway - Half Scale Suspension</td>
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<td>Patrick Ding</td>
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<td>Menson Li</td>
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<td>Matthew Hsiung</td>
<td>Spartan Superway - Half Scale Wayside</td>
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<td>Kha Pham</td>
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<td>Claude Michel</td>
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<td>SJSU Associated Students, College of Engineering, Swenson Builders, Vander-Bend Manufacturing, Bryan Burlingame, Microsoft</td>
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<td>Kathlyn Garces</td>
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<td>Kevin Maligaya</td>
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<td>Jezreel Gajardo</td>
<td>Spartan Superway - One-Twelfth Scale Track</td>
<td>SJSU Associated Students, College of Engineering, Swenson Builders, Bryan Burlingame, Microsoft</td>
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<td>Franklin Kha</td>
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<td>Shengsong Cho</td>
<td>Spartan Superway - One-Twelfth Scale Track Manufacturing</td>
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<td>Ernest Cabreza</td>
<td>Spartan Superway - One-Twelfth Scale Bogie</td>
<td>SJSU Associated Students, College of Engineering, Swenson Builders, Dr. Ken Youssefi, Bryan Burlingame, Microsoft</td>
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<td>Derick Wong</td>
<td>Spartan Superway - One-Twelfth Scale Solar</td>
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<td>Luis Escamilla</td>
<td>Spartan Superway - One-Twelfth Scale Controls</td>
<td>SJSU Associated Students, College of Engineering, Swenson Builders, Halted Supply Co, Bryan Burlingame, Microsoft</td>
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<td>Christopher Hansen</td>
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<td>Steven Mou</td>
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<td>Qihuan Miao</td>
<td>Spartan Superway - One-Twelfth Scale Position Sensing</td>
<td>SJSU Associated Students, College of Engineering, Swenson Builders, Bryan Burlingame, Microsoft</td>
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<td>Zhiwei Li</td>
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Super ZEM Vehicle

Student Team Members:

Ahmad Abudamous (Team Manager)
Cong Cao, Jimmy Huynh
Mohammad Deen
Rohit Lal
Stanio Tse
Thai Pham
Tuan Anh Ngo

Faculty Advisor: Dr. Tai-Ran Hsu

Project Scope and Objectives:

Design and fabricate a fully self-sustainable, zero-emissions vehicle that would be considered affordable by the majority of people in urban areas.

- Design a delivery vehicle with the following parameters:
  - Top speed: 30 MPH
  - Range: 60 miles
  - Curb weight: 350 kg
- Design a new frame composed of lightweight Aluminum which can withstand the load comfortably.
- Design a new drive train system which includes a lightweight motor and pedaling system that would enable one passenger to drive the vehicle.
- Design an on-roof solar system with lightweight panels that will extend the vehicle range by 20%.
- Design a lightweight battery system to provide the vehicle with enough power to run with up to 15 stops in a standard cargo delivery route.

Project Results:

- Completed power requirement calculations in accordance with our design objectives.
- Designed a 3D model of the frame and various components using SolidWorks, and analyze its strength using finite element code called ANSYS.
- Welding of the frame by team members.
- Installation of solar panels, batteries, wheels, motor, driving, and pedaling system.
- Wiring of all the necessary electronic components of the vehicle.
- Testing of the full assembly using various engineering techniques and adjustments.
Regenerative Braking System for Super Mini-ZEM

Student Team Members:
Reginald Imbat (Team Leader)
Angel Avina
Christopher Breecher
Thom Angelo Sabater
Chun Wing Li

Faculty Advisor: Dr. Tai-Ran Hsu

Project Scope and Objectives:
To prove the principle, by design and prototype testing, of kinetic energy recovery through regenerative braking and spinning electromechanical systems (RBS). A special RBS consisting of a spinning flywheel was redesigned and analyzed to make it more suited for the high performance of the existing SJSU Mini-ZEM vehicle.

1. Theoretically incorporate the Mini-ZEM in testing and calculations to RBS
2. Test the redesigned RBS for positive regenerative energy output
3. Retrofit the existing RBS to minimize its weight and increase its efficiency by creating a driveline template for future design use and refinement
4. Obtain energy output data of the RBS between 1000-3500 RPM with new planetary gearbox
5. Obtain output data of the RBS’s alternator for analysis of the quantity of regenerated energy output for the following:
   - The number of batteries required to drive the Mini-ZEM
   - Confirm motor selection or reject and suggest replacement
   - Amount of regenerated energy not captured by the RBS due to losses
   - Calculate maximum performance for Mini-ZEM for a 40 minute interval at 30 MPH
6. Research methods to interface alternator with motor batteries for charging

Project Results:
1. Twice redesigned the RBS with higher output gear ratios
2. Calculated a max output of the RBS to be 2.8 kJ
3. Affirmed positive regenerated energy recovery data acquisition with confirmed calibrated stroboscope and laser tachometer instruments.
RADAGAST
Rover-based Ascertainment of Disease Afflicted Grapes with Automated Spectral Tests

Student Team Members: Fabrice Paccoret (Team Lead), Tyler Mori, Kurtis Wendling

Faculty Advisor: Dr. Tai-Ran Hsu

Project Scope and Objectives:
Design, build, and test a student proof-of-concept project aimed at autonomously identifying the presence of powdery mildew on grapevines. This allows for pinpoint treatment of afflicted plants instead of blanket treatment of the entire field.

- Capable of self-navigation in a vineyard by pairing GPS and LIDAR (light imaging, detection and ranging) sensors to perform the majority of the trajectory following.
- Detection of powdery mildew on grapes and leaves through the means of software filtering of camera inputs.
- Employing multispectral imaging for identification of plant material and detection of powdery mildew.
- The specified throughput is 1000 plants per hour which surmounts to 20 acres per hour of operation, achieved through approximately 5% plant scan.

Project Results:
RADAGAST uses the latest in sensors and materials, the rover drives on 2 brushed dc motors with encoders for state feedback trajectory tracking.

- The rover boom carries the RDMS (radial displacement measurement system) which is comprised of a LIDAR sensor for distance proximity measuring as well as GPS, encoder, and hall effect sensing. The data retrieved from the RDMS is processed by an onboard computer to provide GPS coordinate transformations, waveform filtering for reliable position feedback, and trajectory information.
- The boom houses a 5 MP (megapixel) area scan camera and a 2MP multispectral area scan camera. The multi spectral camera is sensitive in RGB (red-green-blue) and NIR (near infrared), and is capable of producing a NDVI (normalized difference vegetative index) filter while the 5MP camera can resolve small instances of powdery mildew on leaves and fruit.
- The computer captures image data using auxiliary image grabbers and runs the acquired images through the image filtering algorithm. Image blurring is suppressed by decreasing camera exposure rates, an image stabilization system, and uniform illumination in the image plane. RADAGAST contains 2x 35 Amp-hour gel cell batteries capable of providing 1 hour of operation to the drivetrain, cameras, sensors and computer.

Heavy Load Stair Climber

Student Team Members:
Weston Furia
Ali Basirat
Jimmy Le
Eliud Luna
Ryan Oliver

Faculty Advisor: James Mokri

Project Scope and Objectives:
Design a way for the SJSU Facilities Development and Operations (FD&O) department to get heavy maintenance equipment from the top floor of the engineering building to the roof at SJSU.
1. Will carry loads weighing several hundred pounds safely up and down stairs.
2. The mechanism will be controlled by a remote control to keep the operator out of harm’s way.
3. Size constraints of the mechanism will conform to any stairwell that goes from the top floor of the engineering building to the roof.
4. Will use high torque, low speed motors and be made from steel due to the requirements of the application.

Project Results:
1. Successfully chosen design for climbing upstairs using an angled tread design and winch motors.
2. Created components and conducted FEA on pertinent parts in SolidWorks.
3. All parts have been acquired and frame, motors, and tread have been assembled.
4. Initial test run of stair climber has been completed and modifications are being made.
5. Leveling mechanism may be required to avoid tipping for future considerations.

Sponsor:
Shorai Batteries Incorporated
Independence High School Auto-Tech Education Pathway

Student Team Members:
Saba Gorji
Matt McGee
Andrew Lau
Reuben Reyes
Raphael Asuncion

Faculty Advisor: Prof. James Mokri

Project Scope and Objectives:

Promote the field of engineering to students at Independence High School (IHS) through automotive principles by creating an educational pathway.

1. Develop a powertrain analysis experiment to familiarize students with engineering concepts.
2. Implement the experiment as a teaching aid for the high school.
3. Create and expand a pathway between IHS and SJSU, and potentially other local colleges and high schools.

Project Results:

1. Provided students at IHS with basic automotive-related engineering concepts such as engine thermal efficiency, drivetrain efficiency, horsepower and torque.
2. Successfully developed a laboratory experiment to be used as a teaching aid.
3. Introduced and familiarized students with problem-solving processes such as data logging, verification of experimental data against theoretical, and deducing and quantifying sources of error in experimentation.
4. Laid foundation for teaching aid to be used in future courses by IHS faculty by:
   a. Repairing and calibrating dysfunctional power dynamometer belonging to Auto Tech department at IHS
   b. Designing software including Excel spreadsheet and Visual Basic scripts to facilitate data collection in experiments
   c. Designed and built a computer stand to facilitate lessons with students

Sponsor:

Independence High School
Zero Net Energy Analysis for Office Building

Student Team Members:
Evan Sarver (Team Leader)
Matt Beauregard
Virgilio Yasay

Faculty Advisor: Professor Mokri

Project Scope and Objectives:
Evaluate and propose modifications to a local office building to achieve Zero Net Energy (ZNE) energy usage.
1. Determine the degradation and efficiency of an existing PV system.
2. Conduct energy audit to evaluate the consumption of the building and to determine areas that can be improved.
3. Research and evaluate energy efficient solutions and renewable energies.
4. Conduct cost analysis and return on investment (ROI) calculations.
5. Build PV cleaning/rinsing system

Project Results:
1. Testing conducted by local UL Lab for our team found that the existing 15 year old PV system has experienced less than 1% performance degradation.
2. Testing also concluded that physically cleaning the modules can increase production by potentially 11%.
3. Conducted a shading analysis showing that the existing PV system receives an average of 73% solar access.
4. Concluded through use of NREL-SAM (Solar Analysis tool) analysis that the installation of microinverters or power optimizer would not significantly increase the production of the existing PV system.
5. Provided solutions to decrease the office building consumption by 17%.
6. Through analysis, it can be concluded that the building will need to install a 5-6 kW PV system to be within 90% of the Zero Net Energy goal.

Sponsor:
Salas O’Brien Engineers Inc.
Solar Assisted Water Heating System

Student Team Members:
  Randy Duong
  Aquiles Manuel Ruiz Marquez
  James Lovlien
  Mario Mitchell
  Jeremy Duke

Faculty Advisor: Professor James Mokri

Project Scope and Objectives:
Design, build and test a solar-assisted water heating system using solar collectors to provide heated water for a mobile shower unit.
1. Design a mounting system to contain and elevate the solar collectors
2. Design lifting system capable of rotating the solar collectors to optimal angle for solar collection
3. Design a thermal storage system consisting of a drainback system with a heat exchanger on the inside of the thermal storage tank.

Project Results:
1. Successfully designed, constructed, and tested the solar-assisted water heating system.
2. Successfully modeled and simulated mounting system to carry the solar collectors at maximum capacity at different angles.
3. Successfully ensured safety of structure by performing structural analysis resulting in a safety factor of five.

Sponsor:
Engineers for Solar Energy (ESE)
Dynamometer Lab for the Hybrid-Electric Vehicle Class

Student Team Members:
  Matthew Williams (Team Leader)
  Leroi Baltazar
  Kiera Pietrangelo
  Andrew Wong
  Hocheol Yu

Faculty Advisor: James Mokri

Project Scope and Objectives:
  Design a new lab for the Hybrid Electric Vehicle class involving a dynamometer.
  1. Design a lab that measures the torque, rpm and power of a hybrid-electric vehicle.
  2. Integrate LabView to record the data.
  3. Rewrite the lab manual to include the new lab setup.
  4. Design and install the proper tie downs for safety.
  5. Test the dynamometer to ensure it can output the required variables.

Project Results:
  1. Successfully acquired a fully functioning dynamometer.
  2. Successfully read the torque, rpm and power of the vehicle tested on the dynamometer.
  3. Successfully designed and acquired the materials to install the tie down.
  4. Designed and applied a LabView program that integrated defined constants with the read data.
  5. Tie down installation was not completed. Final location of dynamometer is yet to be determined

Sponsor:
  Dr. Fred Barez - ME 185 Hybrid and Electric Vehicles Fundamentals Lab
Spartan Vehicle Simulator

Student Team Members:
Paul Li Lozada (Team Leader)
Jesus Carriedo
Allen Hermosillo
Vadim Morgunov
Quyen Tran
Jorge L. Alvarez

Faculty Advisor: Prof. James Mokri

Project Scope and Objectives:
1. Design and build a vehicle simulator to replicate the Roll, Pitch, and Yaw motions and forces felt while driving a performance racecar. The simulator will be used as a training tool for drivers to familiarize themselves with different tracks and challenges faced while racing.
2. Perform motion sickness studies to improve motion sickness remedies.
3. Provide SJSU students with a project that involves hands-on experience for students that will learn how to integrate electronics, software, and hardware, and to learn about fabrication processes.
4. Meet the following specifications:
   a. Three degrees of freedom (3 DOF)
   b. Total weight of simulator frame is 125 lbs.
   c. Accommodate a 6 ft tall, 250lb driver
   d. Motions created by three 24V linear actuators
   e. X-Sim software integrated

Project Results:
1. Designed a CAD model of the vehicle simulator using SolidWorks.
2. Performed a static structural Finite Element Analysis (FEA) on points of interest to verify structural integrity using Ansys.
3. Fabricated simulator frame, sub frame, and attachments.
4. Interfaced electronic hardware with software.
5. Successfully tested the Xsim Game engine.

Sponsor: Associated Students of San Jose State University and Renovo Motors
Two-Dimensional Traverse System for Wind Tunnel Measurements

Student Team Members:
Alyssa Ruiz
Nikolai Cepeda
Ryan Maligaya

Faculty Advisor:
Dr. Syed Zaidi
Dr. Kathryn Gosselin

Project Scope and Objectives:
Design a two-dimensional traverse system for the wind tunnel located in the E141 that mechanically moves a measuring instrument within the test section of the wind tunnel.

1. Design and construct a traverse system to meet the specifications set by Dr. Gosselin:
   ○ System must be modular in order to hold a variety of measurement instruments.
   ○ System must be robust and easy to use; the system will remain in the Renewable Energy Lab for use in future research projects.
2. Create a simple user interface to control the motion of the probe in the XY-plane.
3. Create a program to collect velocity data with a hotwire anemometer.

Project Results:
1. Successfully constructed and assembled two-dimensional traverse system.
2. Created Arduino and LabVIEW interface to control probe location and acquire data using a hotwire anemometer.
3. Tested system and data acquisition methods by multiple experiments regarding instrument calibration, vibration analysis, and data comparison to known values.
4. Created an instruction manual describing proper data acquisition procedure.

Sponsor:
ME Department Grant
Versafox Robotics

Student Team Members:

Kyle Smith
Alan De Lira
Michael Monson
Neel Shah
Victor Vargas

Faculty Advisor: Dr. Syed Zaidi

Project Scope and Objectives:

Design a robotics platform.

1. Design the arm with modular design and an end effector.
2. Use linear encoder for keeping live track of where the end effector is.
3. Use high torque motor with planetary and miter gear powertrain.
4. High level controls, dynamics and MOI calculations.

Project Results:

1. Successfully designed, constructed and tested modular robotics arm.
2. Successfully lift 9lbs of weight at the end effector.
3. Successfully use high level dynamics and encoder date to move the arm.

Sponsor:

Grant from Associate Students, A.S. Grants, College of Engineering, ASME FEST Grant, Self-Funded
LED Cooling Optimization

Student Team Members:
Jason Ersepke (Team Leader)
Francois Labat
Timothy Duggan
Andrea Olivas
Ryan Tsai

Faculty Advisor: Dr. Syed Zaidi

Project Scope and Objectives:
Design and optimize a heat sink for LED panels

1. Investigate different passive cooling techniques to improve the operation of LED panels to be used in the agricultural industry
2. Experiment with different heat sink and heat pipe combinations to collect preliminary data used for optimization
3. Analyze the experimental data to improve the geometry of a heat sink to yield the most effective rate of heat transfer
4. Examine the effects that different surrounding temperatures and humidities have on the LED panel and heat sink

Project Results:
1. Matlab program successfully optimizes heat sink geometry
2. Data shows the improvement in heat transfer for heat sink with and without heat pipe.
3. The operating LED temperature after mounting the heatsink to the base panel was reduced by 40%
4. The operating LED temperature was then further reduced by 31 % after using the fin and heat pipe combination.
5. The data analysis showed a varying trend between humidity and heat transfer.

Sponsor:
Hastest Solutions Santa Clara
Design and Development of Plasma Chambers for Dusty Plasma Research

Student Team Members:
Bojin Liang
Hung Nguyen
Ali-Imran Tayeb
Sze Chung Wong
Abdulmohsin Almudaires

Faculty Advisor: Dr. Syed Zaidi

Project Scope and Objectives:
Design and test apparatus for observing and characterizing the behavior of Dusty Plasma
1. Model and test an airtight vacuum chamber with electrodes for containing low pressure, glow-discharge plasma.
2. Design simulation for expected behavior of charged particles in plasma.
3. Conduct Experiments to characterize plasma properties including current and electron temperature.
4. Design and implement a mechanism for introducing dust particles into uniform plasma.
5. Observe and characterize behavior of dust particles using Langmuir probe, high-speed camera and spectroscopy measurements.

Project Results:
1. Fabricated clear acrylic vacuum chamber for observing plasma, many design iterations required due to malfunctions and improper seals.
2. Determined various factors that affect proper plasma generation, including operating pressure of chamber and strength of power supply.
3. Successfully modeled and simulated the behavior of charged particles in combined magnetic and electric fields barring any collision or coulombic repulsion.
4. Conducted one experiment of plasma characterization under non-ideal conditions.

Sponsor: Intelliscience Research, LLC.
Rapid Splitter

Student Team Members:
- Logan Bekker (Team Leader)
- Alex Mortarotti
- Derrick Lao
- Peter Soto
- Michael Souza

Faculty Advisor: Dr. Vimal Viswanathan

Project Scope and Objectives:
Design a prototype to automate the insertion of battery cables into the rapid splitter body for GSA’s Tesla contract.

1. Replace the inefficient manual press system with an easily controlled automatic press.
2. Have the capability of seating one set of cables simultaneously.
3. Apply sufficient pressure to seat both plugs (35 lbs per plug)
4. Reduce assembly time to less than the current 6 minute assembly time.

Project Results:
2. Designed an end effector capable of adapting to three different plug assembly configurations.
3. Successfully reduced the assembly time of each unit by 3 minutes.
4. Utilizing a dual lead screw design, the system is capable of applying upwards to 80 lbs per plug, more than necessary but ensures proper plug insertion.
5. Implemented a straightforward control panel for technician use.

Sponsor:
Golden State Assembly
**Omnidirectional Powered Cart**

**Student Team Members:**
  Stefan Geiger (Team Leader)
  Joseph Carbone

**Faculty Advisor:** Dr. Vimal Viswanathan

**Project Scope and Objectives:**
  Design a prototype device for omnidirectional conveyance of sensitive medical equipment.
  1. Design a drive system with 3 degrees of freedom.
  2. Design a platform which resists tipping under overload conditions.
  3. Design a robust wheel architecture.
  4. Design a stable control system.

**Project Results***:
  1. Successfully designed, constructed, and tested the drive architecture.
  2. Successfully designed a control system.
  3. Demonstrated platform stability.

* Due to proprietary technology, results presented to public are limited.

**Sponsor:**
  Intuitive Surgical, Inc.
ASME CNC Machine

Student Team Members:
Fernando Rodriguez (Team Leader)
John Noe
Dylan Mole
Kade Pourroy

Faculty Advisor: Dr. Viswanathan

Project Scope & Objectives:
1. Create a CNC Milling Machine to act as a student resource for the members of SJSU’s AMSE.
2. Redesign the CNC machine’s previous prototype, recreate a new design and then implement the changes.
3. Finished product should be able to be moved by a single person.
4. The CNC machine should be capable of milling aluminum and wood.
5. The CNC machine will be accurate to 10/1000th of an inch.
6. The CNC machine will be able to accept any given G-code and output the desired tool path.

Project Results:
1. The CNC machine is a 3-axis machine allowing it to move in all directions simultaneously.
2. The overall weight of the machine has been reduced by over 600 pounds. However, due to its size it is not likely that a single person can move the CNC machine.
3. The CNC machine is capable of milling wood.
4. The CNC machine is accurate to 10/1000th of an inch due to the elimination of backlash between the lead screws and flange nuts.
5. The CNC machine can accept multiple file formats.

Sponsor:
SJSU A.S.
SJSU ASME Chapter
Torque-A-Matic Precision Machining
Design of a Mars Rover

Student Team Members:

David Cruz          Chassis Design
Jim Noe             PODS Design
Jordan Hashimoto    Arm Design
Alexander Moyer     End Effector Design
Giann Penalba       Drive Systems Design

Faculty Advisor: Dr. Vimal Viswanathan

Project Scope and Objectives
Design a rover to perform various tasks to assist astronauts on the surface of Mars.

1. Design a chassis and drive system that is dexterous and can traverse rugged Martian terrain.
2. Design a 5 degree of freedom robotic arm and end effector capable of manipulating 5kg objects and various fixtures.
3. Design Portable Onboard Devices of Science (PODS) to conduct science sampling and experiments in the field.
4. Enter finished rover into The Mars Society’s University Rover Challenge (Jun 01-03)

Project Results

1. Successfully designed, assembled, and tested the rover
2. All systems of rover are mechanically functional
   a. Chassis and drive system can traverse 50° slopes and 16” obstacles
   b. Arm & end effector capable of lifting 7kg masses and reaching 1m above the ground
   c. Demonstrated PODS capable of retrieving soil samples autonomously and transmitting data to the rover
3. Prepared for trip to the Mars Desert Research Station for the competition

Primary Project Sponsors:
- Model Studio
- Protocase
- SJSU Associated Students

Special Thanks:
- Dr. Ken Youssefi
- Dr. Ping Hsu
Collapsible Insulated Mug

Student Team Members:
  Martin Chavez
  Ryan Yu
  Anthony Bowe

Faculty Advisor: Dr. Vimal Viswanathan & Dr. Raymond Yee

Project Scope and Objectives:
  Design a prototype device as a proof of concept.
  1. Design a collapsible mug for convenience, while reducing environmental impact.
  2. Design a feature to safeguard from unwanted leaks.
  3. Design a feature to preserve liquid temperatures for an extended period of time.
  4. Design a feature to control the locking and unlocking states.

Project Results:
  1. Successfully modeled and evaluated the design to achieve portability and reusability.
  2. Demonstrated the collapsing and extending functionalities.
  3. Optimized the design through several iterations and performed analysis.
  4. Evaluated the temperature effects over time.
  5. Successfully experimented with viable components and materials

Sponsor:
  Jason Blum
Assistive Bionic Joint

Student Team Members:
Lyle Kosinski (Team Leader)
Vincent Nagel
Sarah Chu
Jack Forney

Faculty Advisor: Dr. Vimal Viswanathan

Project Scope and Objectives:
Design an electronically controlled prototype device to enrich rehabilitation for patients with partial leg paralysis.
1. Design a mechanical brace for patient support that can withstand a high amount of force
2. Design power electronics and a pneumatic system
3. Design an actuation method that is inherently safe for patient operation
4. Design a control system to interface muscle input with actuation

Project Results:
1. Successfully designed, constructed, and tested the mechanical brace.
2. Successfully created working power electronics and a pneumatic system.
3. Successfully designed and built an actuation system that is safe for patient use.
4. Successfully built electromyographic interface for microcontroller.
5. Successfully designed and created control system utilizing muscle input for brace actuation

Sponsors:
Festo, CalRAM, Associated Students, SJSU fund
Follobud

Student Team Members:
Justin Yu
Puyun Yen
Matt Stewart
Kent Tran

Faculty Advisor: Dr. Viswanathan

Project Scope and Objectives:
Design a prototype tracking tool tray that follows the user.
1. Design a chassis that support the scissor lift and other components.
2. Modify the Harbor Freight Scissor Lift to allow mating with chassis.
4. Create Arduino codes to integrate our Linear Actuator, Motor Drivers, Ultrasonic Sensors, and the Pixie Camera.

Project Results:
1. Successfully designed, and built our Chassis out of T-Slotted Aluminum Extrusions.
2. Successfully modified the Harbor Freight Scissor Lift for mounting to Chassis.
3. Successfully machined the Motor Mounting Block.
5. Demonstrated lifting feature.

Sponsor:
We are a self-sponsored team.
BAJA FINAL DRIVE 2017

Student Team Members:

Charlie Trevaskis
Michael Romero
Jacob Heth
Jordan Coward

Faculty Advisor: Dr. Raghu Agarwal

Project Scope and Objectives:

Design and build the final drive system of the 2017 Baja SAE car. Design should reduce weight over last year while also improving on the previous designs and adhering to the goals of the rest of the car. Must have a forward and reverse as well as interface well with the designed wheel package.

Specifications:

1. 9:1 gear reduction of the gearbox after CVT
2. Forward and reverse capabilities
3. Lower motor by 4 inches
4. Shorten motor bay of frame
5. Reduce rotational inertia
6. Reduce total weight
7. Easier shifting than H-12

Project Results:

1. Built 3-D computer model of entire system.
2. Built a fully functioning prototype to be used on the car in the BAJA competition.
3. Tested the parts of the system individually to validate functionality.
4. Tested the system by driving the car, finding problems, and implementing quick solutions. The car ran and was tested at Hollister, and will run in competition before the end of the year.
2017 Graffiti Removal Robot

Student Team Members:
Nguyen Nguyen (Team Lead)
Jeungmin “John” Kim
Thi Ho
Vincent Lee

Faculty Advisors: Dr Raghu Agarwal and Dr. Winnycy Du

Project Scope and Objectives:

Design and build a prototype for removing graffiti from public view in the “Unleash Your Geek” competition sponsored by the City of San Jose. This competition looks to remove graffiti vandalism over highways. The primary design parameters require the prototype to operate with ease of handling, setup, and use for the city workers. Along with the requirements, the project must also be within the $5000 USD budget given.

Specifications:

1) Includes three parts:
   a) Y-Axis: Assembly of four nozzles with valves
   b) X-Axis: Assembly of ball-screw mechanism to carry Y-Axis in linear motion
   c) Control panel box to hold controllers and electronics components
2) Dimensions: 6 ft (length) x 8 ft (height) x 6 in (width)
3) The whole system weighs about 50 pounds (not including the control panel box)
4) The system is currently powered by wall power supply.
5) Use paint spraying method to cover graffiti of an area of 6”x 8” in one run.
6) Wireless control by the operator.
7) Prototype is able to work while in operation:
   a) Handle the vibrations generated by motor.
   b) Move to different section with ease.
   c) Fixed while device is spraying.

Project Results:

1) Completely assembled X-Axis and Y-Axis as well as the control panel box
2) X-axis system is fully functioning and is able to carry Y-axis across its length
3) Conducted several tests on spraying water:
   a) First test was successfully with 1 nozzle spraying water
   b) Second test was not successfully with 4 nozzles at the same time
      i) Liners were exploding due to unintentionally air flow
   c) Solution to the problem:
      i) Replacing soft liner with harder material paint cup
2017 ASHRAE HVAC Design Competition

Student Team Members:

Wilton Chang (Team Lead)
Matthew Le
Suraj Thapa
Aditya Mairal
Austin Stevenson

Faculty Advisor: Raghu Agarwal

Project Scope and Objectives:
Design a properly sized heating, ventilation and air conditioning system for a meteorological station located in Diego Ramirez Island in Chile. The main objective is to calculate the heating and cooling loads and design a HVAC system for the building that will meet all the latest ASHRAE standards. The goal is also to meet Owner’s project requirements. Also, design a variable air volume (VAV) box for the build part of the project.

Specifications:

1. Demonstrate compliance with the latest editions of ASHRAE Standards 55, 62.1, and 90.1
2. Use variable air volume (VAV) and an air-handling unit for the building.
4. Create a checksum report for each System
5. Create a design cooling and heating block load reports for selection of cooling and heating plants
6. Meet energy, budget and life cycle cost provided by the Owner.
7. Provide necessary sizing, physical location, and final cost for a photovoltaic array to support building energy needs.
8. Minimize maintenance requirement
9. Design a VAV box using Arduino to control the servo that will open and close the VAV box damper based on the cooling and heating needs.

Project Results:

1. Built 3-D Revit model for the building.
2. Performed Load Calculation and created a checksum report for each system.
3. Properly sized all the units based on the load calculation report.
4. Selected a system that best fits the building load, ASHRAE and Owner’s requirement.
5. Built a VAV box.
NASA Ames Research Facility - Simulated Microgravity Environment (SME)

Student Team Members:
Meshal Alshahrani
Karel Bachand
Christopher Kackman
Adam Olson

Faculty Advisor: Dr. Raghu Agarwal

Project Scope and Objectives:
Design and build a 3-D clinostat with a spherical payload. Ideal use is to facilitate ground-based microgravity research at NASA Ames Research Facility with an easy-to-use interface. Primary design parameters are that the microgravity environment should be able to work for two weeks non-stop and have a payload capacity of approximately 14 in³. Additionally, in order to account for various specimen types, the device will accept user input of specimen density, specimen diameter, desired level of microgravity (i.e. 1G - 0.01G) and experiment duration.

Specifications:
1. SME should be able to operate for two weeks.
2. SME should be as compact as possible while maintaining payload size.
3. Payload capacity should be minimum 14.14 in³.
4. SME is to have an easily workable User Interface.
5. SME input parameters should be easily obtainable and allow for easy input.

Project Results:
1. Built a 3-D computer model of simulated microgravity environment.
2. Built a fully functional version of the SME utilizing stepper motors and an Arduino ATMega2560 microcontroller.
3. Conducted testing to ensure that vibrational modes were avoided. Testing was also done to ensure continuous run-time of 2 weeks was achievable.
Jet Turbine Engine

Student Team Members:

Zack Gildden (Mechanical Design and Fabrication)
Esai Coss Robinson (Thermal Fluids and Ignition System)
Alex Kim (Control System and Automation)

Faculty Advisor: Dr. Raghu Agarwal

Project Scope and Objectives:

Design and fabricate a jet turbine engine that produces up to 25 pounds of thrust with a measured thermal efficiency of 35 percent. The purpose of this project is to demonstrate small scale jet engine technology. Primary design parameters are that the engine materials must withstand temperatures of 1200 degrees Fahrenheit while subjected to pressures of 100 psi.

Specifications:

1. Generates 25 pounds of thrust when operated at max power.
2. Measured thermal efficiency of 35% at max power.
3. Operates using multiple types of fuel (propane and diesel).
4. Frame space is constrained to 12 ft³ (3 ft x 2 ft x 2 ft).
5. Weight is constrained to 200 pounds.
6. Frame is equipped with casters for mobility (transportation).
7. Utilizes a 12V DC battery to power pumps, sensors and spark plug.
8. Combustion chamber can withstand up to 160psi and 1200 degrees Fahrenheit.
9. Sensors provide information (Temp, Pressure, RPM’s) to regulate safety and verify engine efficiency.

Project Results:

1. Built a 3-D computer model of the engine unit (SolidWorks).

2. Fabricated a fully functioning small scale prototype of a jet turbine engine utilizing 330 and 304 stainless steel for the combustion chamber. Designed fuel delivery systems for both propane and diesel fuel. Designed oil system for lubrication/cooling of turbocharger axle. Developed circuit for pumps, sensor panel and spark plug. Integrated sensors to ensure engine safety and to monitor engine efficiency.

3. Conducted several tests on the jet engine to verify engine functionality. Test included recording internal temperatures and efficiency at idle, during cycling and at max load to determine engines max thermal efficiency range.
2017 Automatic Beer Dispenser Senior Project Summary

Student Team Members:

Andy Wu (Team Lead)
Ashkon Baharlou
Jose Torres

Faculty Advisor: Dr. Raghu Agarwal

Project Scope and Objectives:

Design and manufacturing of an automatic beer dispenser that can pour a beer efficiently without user instruction. The dispenser allows a user to drop a mug on the pedestal and have a beer poured automatically without any spilling. The purpose is to speed up the bartending position by allowing a bartender to leave a mug to be filled while also taking other orders or charging the customer. The dispenser will also eliminate any human error that can cause a waste of beer in the pouring process. Primary design parameters are that the dispenser must be able to pour a beer without any buttons, fill it without any spilling within half an inch of the top of the mug, and create a head for the beer that is less than one inch thick.

Specifications:

1. Any form factor of mug/pitcher can be used
2. Assembly can be easily attached to a bar set up
3. Any beer can be poured from the robot
4. Fully automated
5. Food safe
6. Beer is poured from the bottom of the mug to prevent excessive foaming

Project Results:

1. Fully designed mechanical, electronic, and fluids systems design
2. Fabricated and assembled a working prototype of the dispenser and wired all of the electronics to the system
3. Set up the assembly with a jockey box and conducted tests to perfect the pouring process the robot undergoes
4. The robot was able to accomplish the tasks assigned to it by the designers
Hybrid Solar/Wind System

Faculty Advisor: Dr. Raghu Agarwal

Student Team Members:
- Evan Langer (Team Lead)
- Jack Fogelquist
- Marcella Quinn
- Irma Gutierrez
- Alex Sura

Project Scope and Objectives:
Designed and built a hybrid solar/wind turbine system utilizing a patented solar panel design by sponsor Dr. Baldev Krishan. Ideal system fits all design specifications listed out below to test the concept design for improved wind turbine efficiency. The final objective to this project is to help provide a sustainable standalone power source.

Specifications:
- a) ≈100W VAWT (Vertical Axis Wind Turbine)
- b) Low cost
- c) Must not impede turbine function
- d) Efficient and lightweight
- e) Must stand-up to the elements
- f) Continuous run time until fatigue failure
- g) Testing for 20% increase in power generation over traditional wind turbines
- h) Minimal losses in motor/turbine interface
- i) Off-the-shelf parts
- j) Easy installation
- k) Easily retrofitted on existing turbines
- l) Quiet
- m) Aesthetically appealing
- n) Easy to maintain
- o) Durable
- p) Safe
- q) Easily monitored power output

Project Results:
1. Completed build of a fully functioning hybrid solar/wind system with majority of off-the-shelf parts
2. Conducted several tests on the hybrid system to measure functionality. Tests included:
   1) Hybrid system in high wind
   2) Hybrid system in low wind
   3) Solar panels on dome in high wind
   4) Solar panels on dome in low wind
   5) Solar panels on roof array in high wind
   6) Solar panels on roof array in low wind
   7) Cooling coefficient for efficiency of solar panels
   8) Calibration of all testing sensors
Spartan Superway - One-Half Scale Bogie, Failsafe and Steering Improvement Team

Student Team Members:

Michael Kemp (Lead)
Jorge Soto

Faculty Advisors: Prof. Eric Hagstrom, Prof. Burford Furman

Project Scope and Objectives:

Improve and re-design bogie to transverse along the guideway provided. Re-design a steering system to safely transition between rails along the guideway. Improve failsafe to prevent the bogie from falling off the guideway.

1. Re-design bogie to transverse along a 17° angle incline at 2-3 mph.
2. Re-design bogie to withstand a 600 lbf weight imposed by the team’s components (Breaking/Propulsion, Wayside, Mechatronics, Suspension and Cabin)
3. Re-design steering system to withstand the forces imposed by the components and safely switch between rails in a 5 second interval.
4. Improve failsafe to prevent the bogie from derailing should the main wheels may sheer off.

Expected and Current Project Results:

1. Successfully re-designed, constructed, and tested mechanical bogie, steering and failsafe.
2. Demonstrated successful transverse along the guideway.
3. Successful reliability and accurate motion demonstrated from steering within the expected time interval.
4. Steering successfully outputs enough torque to withstand all imposing forces.
5. Failsafe favorably withstands the impact should a failure may occur.

Sponsors: Associated Students, Techshop San Jose, College of Engineering, Swenson Builders, Bryan Burlingame
Spartan Superway - Propulsion and Braking for ½ Scale Model

Team Members
Craig Hudacko (Team Leader)
Randy Castillo

Faculty Advisors
Eric Hagstrom
Burford Furman

Project Scope and Objectives:
Design a propulsion system that will move the half-scale bogie along designated railway along with a braking system.

1. Size motors to propel the half-scale bogie and cabin along railway and 17° incline. Design, size, and mount motors to propel the half-scale Spartan Superway Bogie along
2. Design mounts for propulsion motors.
3. Design brake system that will bring the half-scale bogie to a complete stop from approximately 5 mph within 40 feet.
4. Manufacture, assemble, and test overall system in time for Maker Faire.

Project Results:
1. Propulsion motor successfully sized to move a bogie of estimated 600 pounds along railway and incline.
2. Mounts manufactures for propulsion motors and braking motors.
3. Brake mechanism designed and parts close to finish manufactured
4. Expected to complete manufacturing and and assemble components by May 1st.

Sponsors: Associated Students, Techshop San Jose, College of Engineering, Swenson Builders, Bryan Burlingame
Spartan Superway - Active Suspension (Half-Scale)

Student Team Members:

Neil Dey (Team Leader)
Brean Aquino

Faculty Advisors: Prof. Eric Hagstrom, Prof. Burford Furman

Project Scope and Objectives:

Create a suspension system for the Spartan Superway Pod Car that will isolate the cabin from noise, harshness, and vibration to give the rider a pleasurable riding experience. Additionally a secondary objective is to keep the cabin oriented in a safe and comfortable position while traveling down the railway.

1. The active suspension system will keep the cabin level as it transverses through inclines and declines of up to 17 degrees.
2. The active suspension system will reduce the transmitted vibrations of the railway.
3. The active suspension system will be able to support a weight of 600lbs.
4. The active suspension system will level the floor of the cabin with the floor of the platform to provide accessibility to all riders.

Project Results:

1. Successfully re-designed, modeled and fabricated all required components of the active suspension.
2. Working with other sub-teams in Spartan Superway we were able to integrate our active suspension into the entire Bogie system.

Sponsor: Associated Students, College of Engineering, Swenson Builders, TechShop San Jose, Bryan Burlingame
Spartan Superway - Half-Scale Mechatronics and Bogie Integration System

Student Team Members:
  Patrick Ding
  Menson Li

Faculty Advisors: Prof. Eric Hagstrom, Prof. Burford Furman

Project Scope and Objectives:
Design a system that automates the movement of the bogie
  1. Design a power system that distributes power to the electronics.
  2. Design steering, propulsion, braking and suspension controls for the bogie.
  3. Design a program to power electronics independently.

Project Results:
  1. Successfully designed, constructed, and tested the power system.
  2. Successfully built a working prototype that simulates the bogie movement.
  3. Demonstrated electromechanical movement of steering links.
  4. Evaluated the power distributions to electronic components.
  5. Bogie was able to complete a full loop on the track successfully.

Sponsor: Associated Students, Swenson Builders, College of Engineering, Halted Supply Co, Bryan Burlingame
Spartan Superway – Wayside Power

Student Team Members:
Matthew Hsiung
Kha Pham

Faculty Advisors: Prof. Eric Hagstrom, Prof. Burford Furman

Project Scope and Objectives:

1. Design an electrical system that supplies the vehicle with power from a solar energy supply.
2. Design and implement a rail contact system as an energy transfer to the vehicle.
3. Design and install a shoe collector that will contact the electrical rail and connect to the onboard electrical equipment.
4. Develop in accordance to safety, cost effective maintenance, and fabrication.
5. Run and test the stability of the system to ensure resilience.

Project Results:

1. Successfully designed and implemented a mounted electrified rail along the track.
2. Discovered cost effective methods of maintenance with erosion resistant conductive solvent.
3. Fabricated rails and wiring in a cost effective method.
4. Measured and optimized the specification of the rail to hold 60 Amps at 120 Volts.
5. Mounted 4 collector shoes to the vehicle with wiring to supply electricity from contact.
6. Successfully redesigned around old rail system to retrofit new designs and specifications.

Sponsors: Associated Students, Swenson Builders, College of Engineering
Spartan Superway – Full Scale Track Development (Supports and Railings)

Student Team Members:
- Winter Saeedi (Team Leader)
- Claude Michel
- Kathlyn Garces
- Kevin Maligaya

Faculty Advisors: Prof. Eric Hagstrom, Prof. Burford Furman

Project Scope and Objectives:
Design a support track capable of suspending Spartan Superway safely, minimizing cost.
1. Consider orientation of columns and footings in relation to existing city infrastructure.
2. Ensure columns are strong enough to withstand the weight of a cabin (~3600 pounds) through examination of a new experimental form of concrete filled tube (CFT) beams based on designs from our contact.
3. Develop clamps to attach interlocking columns to guideway rails, preventing compromise of the steel’s strength properties through bolting or welding.
4. Create an architectural model depicting aesthetically-pleasing designs for the Superway structure, keeping solar panel positioning, general dimensions, and design in mind.

Project Results:
1. Became limitedly familiar with beam design and numerical properties, due to inability to test and document.
2. Collaborated with a team in South Africa to develop an interlocking column design filled with concrete for enhanced strength.
3. Created two laser-cut rapid prototypes portraying the interlocking column and one T-shaped structure with wooden columns, later manufactured a steel stub version from Vander-Bend Manufacturing.
4. Designed a basic clamp and truss system, including several means to attach external fixtures such as the guideway and solar array.
5. Structural designs offered in architectural model: “Palm Tree,” and two versions of “Cat’s Eye.”

Sponsors: Associated Students, College of Engineering, Swenson Builders, Vander-Bend Manufacturing, Bryan Burlingame
Spartan Superway - One-Twelfth Scale Track Improvement Team

Student Team Members
Andrew Snytsheuvel
Franklin Kha
Jezreel Gajardo

Faculty Advisors: Prof. Eric Hagstrom, Prof. Burford Furman

Project Scope and Objectives:

Improve the previous year’s track.

1) Design the track to be adjustable to be used on uneven ground.
2) Evenly space out the track so that the bogie does not get stuck or fall off.
3) Make the track easier to assemble and disassemble.
4) Make the track compatible with other teams.

Project Results:

1) Slotted the vertical supports so that the track at each location of a support, could move up or down accordingly.
2) Designed and 3D printed many U-brackets that effectively aligned the track’s spacing and keeps track even.
3) Successfully replaced all points where aluminum was threaded for longer life of track.
4) Successfully incorporated dependencies of the five other 12th scale teams such that everything ran accordingly.

Sponsor: Associated Students, Swenson Builders, College of Engineering, Bryan Burlingame

![Image of track setup]
Spartan Superway:  
1/12 Scale Track Manufacturing and Process Development

Student Team Members:  
Shengsong Cho  
Kevin Yoshihara

Faculty Advisors: Dr. Burford Furman, Prof. Eric Hagstrom

Project Scope and Objective:  
Provide reliable manufacturing for the 1/12 scale Spartan Superway at minimal cost:  
1. Design and create a machine and corresponding processes to manufacture corner sections of track reliably and repeatedly.  
2. Manufacture corner sections of track with different radii.  
3. Manufacture solar panel rack and associated items.

Project Results:  
1. Successfully designed and built the corner track bending machine.  
2. Successfully manufactured corner sections of track to meet specifications made by the Track Improvement Team.  
3. Successfully manufactured solar panel rack and ribs as requested by the Solar Team.  
4. Cost to the project was minimized by recycling extra material from previous years, use of in-house fabrication, and external sources of free material.

Sponsor: Associated Students, Swenson Builders, College of Engineering, Bryan Burlingame
Spartan Superway - One-Twelfth Scale Bogie Improvement Team

Student Team Members:
Ernest Theo Cabreza (Bogie Design)
Moralma Rodriguez (Cabin Design)

Faculty Advisors: Prof. Eric Hagstrom, Prof. Burford Furman

Project Scope and Objectives:
Design a new and improved bogie and cabin for small scale
1. Design a bogie and cabin that can be easily 3D printed and maintained
2. Design a switching mechanism for the bogie that is consistent and easily maintained
3. Design a cabin that can hold all required electronic parts and can be easily accessed
4. Design a bogie and cabin that will be able to go through the track smoothly without interfering with sensors
5. Have 6 3D printed bogies and cabins manufactured and fully functioning

Project Results:
1. Successfully designed and 3D printed 6 bogies and cabins
2. Successfully designed and 3d printed a bogie switching mechanism that is easily maintained and functions consistently
3. Successfully designed a cabin that housed all electronic parts that can be easily accessed
4. Bogie and Cabins successfully run through the track and function properly
5. Successfully had bogies and cabins ready by time of exhibits

Sponsor: Associated Students, Dr. Ken Youssefi, Swenson Builders, College of Engineering, Bryan Burlingame
Spartan Superway - One-Twelfth Scale Solar Improvement Team

**Student Team Members:**
Derick Wong

**Faculty Advisors:** Prof. Eric Hagstrom, Prof. Burford Furman

**Project Scope and Objectives:**
Design multiple solar panel arrays to provide power to pod cars for 1/12 scale model of Spartan Superway.
1. Design a solar panel racking solution that mounts above the track
2. Must be curved and able to tilt for increased efficiency
3. Must be robust but also simple to disassemble and reassemble
4. Must demonstrate the need and sustainability of renewable energy

**Project Results: (Below is an example)**
1. Successfully designed, constructed, and tested 2 solar panel arrays
2. Successfully designed, constructed, and tested a storage solution for charging components
3. Successfully provide power to bogies via battery charging

**Sponsors:** Associated Students, Swenson Builders, College of Engineering, Bryan Burlingame
Spartan Superway – 1/12th Scale Vehicle Controls Team

Student Team Members:
Chris Hansen (Team Leader)
Luis Escamilla
Steven Mou

Faculty Advisors: Prof. Eric Hagstrom, Prof. Burford Furman

Project Scope and Objectives:
Design a new automated control system for the 1/12th scale Superway model.
1. Simplify electronics and componentry.
2. Improve track switching methodology.
3. Fulfill requirements for implementing Software Team’s complimentary mobile application support.

Project Results:
1. Successfully tested and chose new microcontroller and sensor components to decrease complexity and improve robustness.
2. Constructed simple switching methodology based on track-mounted magnets and podcar-mounted hall effect sensors.
3. Completed coding involving functions to carry out actions given from central computer system via Software Team.
5. Built and tested microcontroller expansion boards and modularized components for six identical podcar control systems.
6. Demonstrated control system in use at Paseo Prototyping Festival.

Sponsor:
Halted Supply Co (HSC), Associated Students, Swenson Builders, College of Engineering, Bryan Burlingame
Spartan Superway - One-Twelfth Scale Position Sensing Team

Student Team Members:
Qihuan Miao (Team Leader)
Zhiwei Li

Faculty Advisors: Prof. Eric Hagstrom, Prof. Burford Furman

Project Scope and Objectives:
Design a position sensing system for the Spartan Superway one-twelfth scale model

1. Design a position sensing system with corrugated ferrous strips, Hall Effect sensors and magnets.
2. Design a device to manufacture the corrugated ferrous strips.
3. Design a linear encoder with Hall Effect sensors and magnets to detect the peaks of the corrugated metal strips.
4. Program the linear encoder in order to provide incremental position signal to the position sensing system.
5. Integrated the linear encoder and the corrugated metal strips with the one-twelfth scale model.

Project Results:
1. Successfully designed a device and manufactured the corrugated ferrous strips.
2. Successfully created linear encoders with Hall Effect sensors and magnets.
3. Successfully program the encoder to output position sensing signals.
4. Successfully integrated and demonstrate the position sensing system.
5. The smallest displacement of the bogie could be detected is evaluated to be 6 ± 1 mm.

Sponsors: Associated Students, Swenson Builders, College of Engineering, Bryan Burlingame