

## 2006 – 2007 Senior Project Ideas

Prof. Raghu Agarwal ([ragarwal@sjsu.edu](mailto:ragarwal@sjsu.edu)) 924-3845

	Title	Team	Skills Needed	Funding
1	Human Powered Vehicle	4-6	Hands-on	Self
2	SAE Formula 1 Car	4-6	Hands-on	Self
3	Minibaja all terrain vehicle	4-6	Hands-on	Self
4	Other student-interest project	TBD		

Prof. Buff Furman ([bjfurman@sjsu.edu](mailto:bjfurman@sjsu.edu)) 924-3817

	Title	Team	Skills Needed	Funding
1	Industrial Automation Project 1	3-4	Design, fabrication	Industry
2	Industrial Automation Project 2	3-4	Design, fabrication	Industry
3	TBD	TBD	Mechatronics, design, fabrication	MAE
4				

Prof. John Lee ([sjlee@sjsu.edu](mailto:sjlee@sjsu.edu)) 924-7167

1. Title of Project

Hybrid Actuator for Micropneumatic Deformable Membranes

2. Short description of the project objective

Design and demonstrate a working interface between microscale pneumatic membranes and an external actuator. Some actuator possibilities include but are not limited to piezoelectric, electromagnetic, thermomechanical, and shape-memory-alloy principles, and the design team is highly encouraged to take a methodical approach to comparing relative merits in the selection process. Elastomer microvalves from ongoing MEMS research at SJSU will be provided. Although the proposed senior project is focused on the actuator portion, depending on interest the team is welcome to engage in design activity more specifically related to the microvalves as well.

3. Type of skills/interests that will best match project work

Hands-on experimental skills with actuator components and digital-to-analog interfacing is directly relevant, and team members should have performed well in both ME106 and ME120. At least two team members should have basic skills in prototype fabrication at least at the level of ME110. For a good fit team members should have interest in microelectromechanical systems (MEMS), and exposure to MEMS (as in ME189) is helpful but not mandatory.

4. How many students are needed

Preferred team size is three, although two or four is acceptable.

5. How the project will fund purchase of materials, etc.

The research investigator (Prof. Lee) will provide parts and materials. Students are not expected to pay out-of-pocket expenses on this project.

6. Contact information for further details

Contact Prof. John Lee for information. Office hours and other contact information at <http://www.engr.sjsu.edu/sjlee/>. Background information related to MEMS research activity at <http://www.engr.sjsu.edu/sjlee/mems-lab/>.

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Prof. Nicole Okamoto < [nicole.okamoto@sjsu.edu](mailto:nicole.okamoto@sjsu.edu) > 924-4054

Topic: Design and Construction of a Lab Experiment for ME 146 Thermal Management of Electronics: Liquid Cooling of Electronics Components

Description: This lab experiment would involve designing, building, and testing a lab experiment that would be used in ME 146. Some high-power electronics are cooled using liquid. Companies are reluctant to use liquid, but more may be moving in this direction as electronics become more high-powered. This lab will involve scaling up a typical channel used for liquid cooling. In this experiment, different ranges of heat fluxes should be applied to the channel, and different flow rates should be applied using a variable speed pump. Thermocouples would be used to measure fluid and surface temperatures, and Labview could be used for data acquisition. Results would then be compared with theory.

Types of skills needed: good knowledge of heat transfer; one student with a good grasp of controls would be very helpful

Number of students: no more than three; hopefully at least one would have already had ME 106

added bonus: There should be a good opportunity to use some of this work for your ME 120 project.

funding: equipment would be purchased with a grant that Dr. Okamoto has received

for more info: See Dr. Okamoto (on campus Tues/Thurs only this semester)

## **Project 1: Collapsible Car**

### **Sponsored by Paul Kutler (ME instructor)**

Money will be available for prototype construction.

Project Objective: To design and fabricate a collapsible vehicle that can be transported by airplane and used on local street.

#### Design Requirements

- Two passenger-side by side or tandem
- 500 pound payload (200 lb per passenger, 100 lb baggage)
- Baggage holder
- Max speed 35 MPH
- Automatic transmission
- Powerful enough to climb a 5-degree incline
- Assembled in less than 15 minutes
- Gas or electric powered (4cycle engine if gas powered)
- Weighs less than 150 pounds
- Range of 50 miles
- Contained in box 3f x 2f x 2f.
- Minimum instrumentation includes gas gage and speedometer.
- Sufficient lighting for safe operation in bike lanes.

Team: 6 to 8 students

Automotive Engineering, Mech. Design, and Control backgrounds are preferred.

Contact: Paul Kutler (P/T instructor) for further details.

## **Project 2: Senior Walker with Emergency Lifting Device Sponsored by Dr. Yee (partial financial support)**

Design Objective: Design and fabricate a fully functional walker with air activation lifting system for senior citizen.

Design Requirements:

- Lifting platform is fully automated
- Prefer to operate with air activation system
- Operate with rechargeable DC power source
- Slow, safe, and stable lifting motions
- Built in safety mechanisms
- Accessible handles and comfortable materials in contact with body
- Able to lift a person up to 250 lbs
- Able to be operated solely by the user
- Converts to a fully functioning walker
- Lightweight and portable to use for indoor and outdoor

Team: 4 students

Mechanical design, pneumatic control, and machining skills are desirable.

Contact: Dr. Raymond K. Yee for further details.