



School of Engineering and Technology

650 W. Easterday Ave. • Sault Ste. Marie, MI 49783 • (906) 635-2207 • (906) 635-6663 (fax) • ENGINEERING@LSSU.EDU • <http://ENGINEERING.LSSU.EDU>

LAKE SUPERIOR STATE UNIVERSITY

Industrial-Based Senior Projects

BACKGROUND:

Thank you for your interest in sponsoring a senior project with the Lake Superior State University (LSSU) School of Engineering and Technology. We hope to select the senior projects for the 2008-2009 academic year by the early part of August 2008. LSSU has conducted numerous senior projects for over two decades, mostly partnering with industry. These projects have resulted in excellent outcomes thereby providing an excellent experience for all the stake holders, namely, the industrial partners, the LSSU engineering and technology graduates, and LSSU faculty and staff.

As you may know, all LSSU engineering and engineering technology students are required to work on a senior project during their final year. The project can be research based, co-op based or industrially based. Most of our projects are industrially based. That is where you come into the picture, and that is the subject of this document.

During the spring and summer, we recruit projects from industrial partners. Projects are submitted from a variety of companies within Michigan, the surrounding states, and Canada. Around the first or second week of August, the Senior Projects Faculty Board (SPFB) reviews and then selects the projects for the following academic year and assigns students to the projects. The students begin work on the projects in early September and are scheduled to complete the projects in late April of the following year. The SPFB assigns a Faculty Advisor to each project. Together the Faculty Advisor, the industrial partner, and the SPFB oversee the project for its entire duration. The SPFB works closely with the industrial partner to define the scope of the project early in the fall semester. The SPFB also monitors project progress and may adjust the project scope during the academic year after discussions with the industrial partner.

The fee for the project is set at \$2,500 plus 5% of the project budget, not to exceed \$3,500. This is in addition to actual material expenses necessary to complete project. Neither the students nor the faculty are paid for their engineering work. The customer owns all designs, prototypes, or systems that result from the project, but must agree not to hold LSSU or the students liable for repercussions of any design or build flaw. The customer must provide an engineer who will act as the Industrial Contact for the project. The Industrial Contact is requested to attend a kick-off meeting in mid to late August (if needed), provide input through periodic informal telephone meetings, attend series of three formal design reviews, and to attend the final presentation in early May. The design reviews may be conducted via videoconference.

LSSU senior projects have won many awards national design competitions (6 since the year 2000). We are proud of both the quality of our projects and the awards that the projects have received. Your support of an LSSU senior project is an excellent way to receive an engineered project at a low cost and to support the LSSU engineering and engineering technology programs.

If you have any questions about LSSU industrial-based senior projects, contact the SPFB chairman, Jim Devaprasad, at 906-635-2131 or at JDEVAPRASAD@LSSU.EDU. We look forward to receiving a project proposal from your organization.

Project Selection Criteria

There are numerous factors that are considered by the Senior Projects Faculty Board while selecting the senior projects for an academic year. Here are some of the main considerations:

- 1) Is there a good match between the senior students and the projects being considered? (For example: in a particular year there may be far more electrical engineering students than in the other fields, which means, more EE based projects will be selected).
- 2) Is there a good match between the resources at LSSU (faculty, staff, lab facilities, etc.) and the projects?
- 3) Does the scope of the project fit the LSSU academic time frame? That is, the project scope should be appropriate so that it can be completed over two semesters (30 weeks) with a student team which typically consists of 5 members who are expected to put in about 15 hours per week per team member.
- 4) Is the project clearly defined and with achievable outcomes?
- 5) Is there clear evidence of engineering and financial support that will be provided by the sponsoring organization?

Project Proposal

INSTRUCTIONS:

Thank you for your interest in sponsoring a senior project with the LSSU School of Engineering and Technology. We hope to select the projects for the 2008-2009 academic year by early August 2008.

Fill in the attached form as best as you can. The areas under the headings are intended for you to insert your own words. The *italicized text is a hypothetical proposal* and is intended to give you an idea of what to write. Just delete the italicized examples and insert your own words.

We don't need to know all the details about your project at this point. We are mainly looking for a broad description of your project and your contact information. It should take you about an hour to fill out the form.

You can either send the form by postal mail or by electronic mail.

By postal mail

Jim Devaprasad
Lake Superior State University
School of Engineering and Technology
650 West Easterday
Sault Sainte Marie, MI 49783

By electronic mail

JDEVAPRASAD@LSSU.EDU

If you need any assistance, contact the SPFB chairman, Jim Devaprasad, at 906-635-2131 or at JDEVAPRASAD@LSSU.EDU.

Thanks again for your interest!



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PROJECT SUBMITTAL FORM

Company Background

Briefly describe your company and your division.

Vivicom is a division of Vivitel International, Inc. Vivitel International has 8,500 employees at 13 sites throughout the United States. The company designs and manufactures specialized electronic components for electrical equipment manufacturers in the United States and Europe. Vivicom has 1,250 employees and is located in Ann Arbor, Michigan. Vivicom designs and manufactures ultra fast electronic switches to telecom companies and satellite manufacturers.

Project Description

Briefly describe the nature of the project. What is your need? What is the expected outcome?

We have a \$22.6M contract to design a digital router that may be packaged into a subsystem for a satellite. The router must run at 30 GBytes per second and must run off of 12 V and consume less than 25 mW of power. The router is currently being designed and we plan to manufacture prototypes by July 2008.

We want LSSU to design and build a test stand to verify the operation of prototypes of this router unit. The test stand should allow our engineers to insert router prototypes and test their operation. The test stand should simultaneously send 300 10MHz test signals to the router and then check the output signal to see if any error has occurred.

The expected outcome will be a fully functional test stand that our engineers can use to test router prototypes and documentation that would allow us to construct additional test stands.

Budget

Give a ball park estimate of the cost of materials and supplies for this project. Do not include your engineering cost or the \$2,500 - \$3,500 project fee.

I have forecast that this project will cost approximately \$50K. The cost for building materials of the physical test stand structure will be about \$10K. The cost for the high-speed electronics in the test stand will be about \$40K.

Technical Content and Required Expertise

Specify the type of engineering work that will be needed to complete this project. Also estimate the number and discipline of the engineering students that you estimate will be needed.

This project will entail the following technical tasks:

- 20% identification and purchase of high-tech communication modules
- 35% hardware design to mount and interface the communication modules
- 35% assembly level programming
- 10% design of prototype package

The project will likely need the following student workers

- 3-4 electrical engineers (ability to design digital circuits, ability to design analog communications and understand the mathematics of modulation)
- 1-2 computer engineers (ability to program in assembly and thorough understanding of communication mathematics)
- 1 manufacturing technologist (ability to design small-scale, lightweight packaging of electronics)

Industrial Support

List the types of support, other than money and the time of the industrial contact, that your company will provide for the project. Also list the types of support that your company will not provide for the project.

The industrial contact will provide expertise in the area of high-speed electronic communication theory and high-speed electronic communication software algorithms. Several engineers within the company will provide expertise regarding high-speed electronic hardware. The company will also provide a C programming developmental environment and an extensive C communications library.

We cannot provide any mechanical expertise in designing or building the physical structure of the test stand. The physical construction of the test stand must be done at LSSU.

Contact Information

Provide your information and the information of the likely industrial contact for the project. If you will be the industrial contact for the project or if this person has yet to be identified, just leave the latter part blank. The longer the Industrial Contact has been at your company, the more likely your project will be successful and be selected.

Person Submitting Proposal

NameRufus Leaking
Title.....Senior Design Engineer
Company.....Vivicom, Inc.
Phone.....734-123-4567
Email.....rleaking@vivicom.com
Tenure17 years

Likely Industrial Contact

Name Sharon Sharalike
Title..... Design Engineer
Company..... Vivicom, Inc.
Phone..... 734-123-4568
Email..... ssharalike@vivicom.com
Tenure..... 8 years



OPTIMIZED SIGNAL ROUTING

Team Members:

Johnny Clemente, Nik Hargenrader, Austin Hicks,
Calvin Mattson, and Andrei Sawruk

Faculty Advisor: David Baumann

Project Sponsor: Delphi Steering Systems

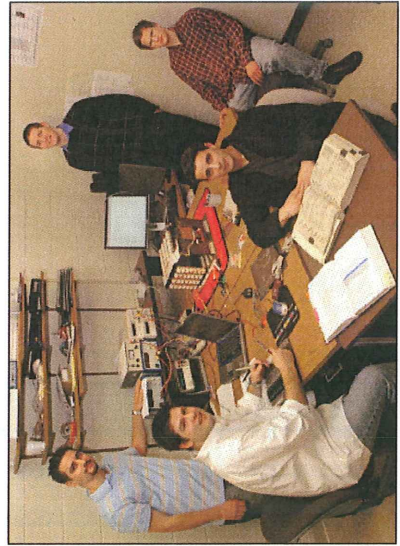
Industrial Customer Contact: Tim Bennett

Presentation: 4:00 p.m., CAS 123

Demonstration: 4:45 p.m., CAS 122

Team OSR has built and tested a unique connection harness to establish proper signal routing during Delphi's steering system testing process. The programmable signal router that will provide a more cost-effective and efficient testing device. It will allow Delphi engineers to program the routing of signals in any configuration needed to establish proper interfacing to any model of steering column.

The 2006-07 senior project team Universal Signal Routing handled Phase I of the harness by developing the design and proof of concept. OSR completed Phase II which was the construction of a prototype, and testing and manufacturing six signal routing boxes for Delphi.



Team OSR's work with Delphi was featured in the March issue of *Upper Peninsula Business Today* magazine.

*Cooperative Education Participants

The following students, who have or will be completing their senior design projects through cooperative education employment at various industries, participated with this year's teams during the fall 2007 semester:

ORD: Mike Ginop

The School of Engineering and Technology is comprised of the following disciplines:

- Computer Engineering
- Electrical Engineering
- Mechanical Engineering
- Manufacturing Engineering Technology
- Industrial Technology
- Engineering Management

All of the senior engineering and technology students at Lake Superior State University are required to complete a challenging senior design project.

The students work in teams and use a composite of their technical and general education courses to successfully complete these projects.

Each project requires a detailed technical engineering analysis and is a challenging and realistic experience for our graduates. The intention of the senior design project is to provide valuable engineering experience that will help the team members transition well from academia to industry or graduate school.

*For more information about LSSU's
School of Engineering & Technology,
contact the office at 906-635-2207*

or visit us online at

<http://www.lssu.edu/eng>

LAKE SUPERIOR
STATE UNIVERSITY

The School of
Engineering & Technology
presents the

Class of 2008 Senior Design Project Presentations & Demonstrations



Friday • May 2, 2008
1:00 p.m. - 5:00 p.m.

in the

Center for Applied Science
and Engineering Technology

INTEGRATED VASCULAR INNOVATIONS



Team Members:

Aaron Hoffmann, Michael Stumpo and
Stephen Tillotson

Faculty Advisor: Andrew Jones

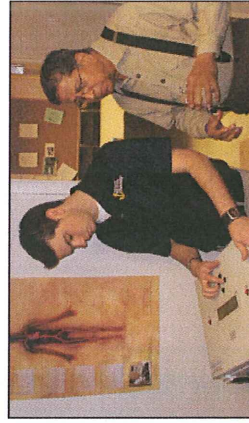
Project Sponsor: Cardio Vascular Research
Institute of New Mexico

Industrial Customer Contact: Dr. George Chandran

Presentation: 1:00 p.m., CAS 123

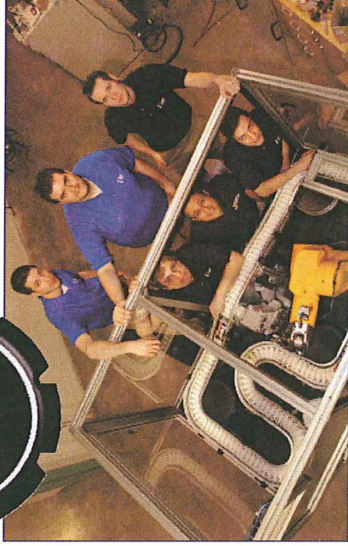
Demonstration: 1:45 p.m., CAS 119

Team IVI designed a medical thrombosis prevention prototype to decrease the risk of lower-extremity venous thrombosis, blood clots in the leg veins of human individuals. It improves blood circulation by applying pressure to different parts of the patient's lower extremities in a timed sequence. The parts of the device include two cuffs: one for the upper thigh and another around the foot along with a controller to synchronize the operation with an air pressure supply unit. It allows medical professionals to conduct clinical trials and produce documentation to assess the effectiveness and safety of the device.



Team members travel to New Mexico to visit Dr. Chandran's clinic and validate the device on a patient. Above, Mike Stumpo operates the device while Dr. Chandran observes. At left, Aaron Hoffmann, points out the location of the vein. The cuffs can be seen on the foot area and the upper thigh.

SUPERIOR VISION SYSTEMS



Team SVS poses with its portable robotic workcell for an AMT news release.

Team Members:

James Claus, Tim Horrigan, Andrew Lucarelli,
Andrew Richards, and Aaron Worden

Faculty Advisor: Taskin Padir

Project Sponsor: Applied Manufacturing Technologies
Industrial Customer Contact: JP Rasaiah

Presentation: 1:45 p.m., CAS 123

Demonstration: 2:30 p.m., CAS 125-Annex

Applied Manufacturing Technologies, Inc. required a portable robotic workcell to demonstrate current technology at trade shows and open houses. Team SVS designed and built a workcell which integrates a robotic arm, vision system, and conveyor system. It accepts a user-defined product order via a touch screen, and relay the information to the robot arm. The robot fulfills the order through the use of a camera to recognize the products, retrieve them from the conveyor system and place the products on an output shelf.



OFF ROAD DESIGNS

Team Members:

Charles Birbeck, Matthew Brehmer, Jason Filek,
Anthony Fleming, John Geukes, Jacob Hauser,
and Christopher Parlowe

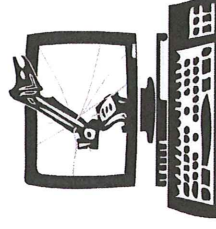
Faculty Advisor: Jon Coullard

Project Sponsor: Lake Superior State University-SAE
Industrial Customer Contact: Paul Duesing

Presentation: 2:30 p.m., CAS 123

Demonstration: 3:15 p.m., CAS 122

The key goals for Team ORD were to design and build a lightweight, fast, and strong mini Baja vehicle to compete at the Baja SAE Illinois Competition in June. The competition will consist of several dynamic and static events that will test the performance of the vehicle. Dynamic events measure the acceleration, handling, and endurance. Static events measure the quality of the design, safety and costs.



ONLINE ROBOTIC SYSTEMS

Team Members:

Paul Bonamy, Gail Dyer and Justin Hester

Faculty Advisor: Wael Mokhtar

Project Sponsor: Lake Superior State University
Industrial Customer Contact: Morrie Walworth

Presentation: 3:15 p.m., CAS 123

Demonstration: 4:00 p.m., CAS 125-Annex

Team ORS has implemented an internet-based robotic system. The controls between all the components of the project are designed for ease of use and allow for future expansion. Each component was researched and designed to meet safety and usability specifications provided by several organizations. The online system can be used by anyone, regardless of experience level.

There are three modes of operation: Users can play games using prepared programs; a freeform mode with interactive controls; and a programming mode which allows users to write custom code.



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Senior Projects Final Presentation

EVALUATION SHEET *(Please return to Video Camera Person in CAS123)*

Team: _____ Grader: _____ Date: _____

Grade: _____ (out of 100) Affiliation: _____

PRESENCE AND STYLE

_____ (out of 20)

- A. Poise and eye contact
- B. Enthusiasm and vigor
- C. Effective use of gestures
- D. Professional appearance
- E. Displays confidence

ORGANIZATION

_____ (out of 30)

- A. Strength of introduction
- B. Introduction of self and team
- C. Explanation of project
- D. Simplicity and structure of presentation
- E. Ability to simplify confusing issues
- F. Flow and transition of presentation
- G. Effective use of time

ANALYSIS OF ISSUES

_____ (out of 30)

- A. Knowledge of the project
- B. Identification of challenges and how they were handled
- C. Logical and persuasive presentation of the project implementation
- D. Clear explanation of why conclusions are reasonable
- E. Clear explanation of how major acceptance criteria were met

EFFECTIVE HANDLING OF QUESTIONS

_____ (out of 20)

- A. Responsiveness and receptiveness to questions
- B. Succinct answers with adequate explanation

GENERAL COMMENTS (please feel free to use back of sheet for additional space)

2008 Membership Status and Information Update

Name: _____

Spouse's name: _____

Home Street Address: _____

City, State ZIP: _____

Home Phone #: _____

Cell phone #: _____

Home email: _____

Work Place Name: _____

Title _____

Street Address: _____

City, State ZIP: _____

Work Phone #: _____

Work Fax #: _____

Work email: _____

The preferred way to reach me is: _____

(email, cell phone, home phone - etc)

LSSU IAB status: **Circle one!!** - please

Full Membership

I meet one or more of the criteria outlined in the IAB Member Role Statement and Responsibilities and would like to remain an active member with Full Membership of the IAB.

Or

I was not able to meet one or more of the criteria outlined in the IAB Member Role Statement and Responsibilities in the past 12 months due to unusual circumstances but would like to remain an active member with Full Membership of the IAB.

Supporting Membership

I did not meet one or more of the criteria outlined in the attached Supporting IAB Member Role Statement and Responsibilities and would prefer to be considered for Supporting Membership for the IAB. I understand that I may resume participation in any or all of the prescribed IAB activities and change my membership to "Full" at any time during the next 12 months.

Former Membership

I prefer to have my name removed from the IAB listing. I understand that I will not receive or review minutes and activities. I understand in the future that I can always change my status and become a Supporting or Full Member. As a former Member in the future I must make initial contact to become a Supporting or Full Member