



**THE INAUGURAL COLLEGE OF ENGINEERING
DESIGN DAY: FRIDAY, 8th OF DECEMBER 2006**

Electrical and Computer Engineering Activities

THE INAUGURAL COLLEGE OF ENGINEERING DESIGN DAY
FRIDAY, 8TH OF DECEMBER, 2006



MICHIGAN STATE
UNIVERSITY

*Bringing together different skills, different minds and different human experiences
to create solutions that advance knowledge and transform lives,
here and throughout the world.*

Five colleges:

The College of Agriculture and Natural Resources
The College of Arts and Letters
The College of Communication Arts and Sciences
The College of Engineering; and
The Eli Broad College of Business

Detailed Presentation Schedule

ECE-Sponsored Presentations at Design Day

Friday, December 8, 2006

MSU Union Building

ECE 480, Senior Capstone Design (open to the public)

Posters and Prototypes - Questions and Answers

8:00am-2:00pm, Second Floor, Parlor C (joint with ME 481)

Final Oral Presentations

8:00am - 1:25pm, Lake Superior Room, Third Floor

Time:	Team #, Name, Sponsor:
8:00am:	Team 1, "Control System for Robotic Arm," NASA Goddard Space Flight Center
8:25am:	Team 8, "CAN Interface for Engine Actuators," Siemens VDO
8:50am:	Team 4, "Improved Meter Socket Safety Tester," Brooks UPG
9:15am:	Team 5, "Improved Mouse for User with Cerebral Palsy," DaimlerChrysler & Res. Ctr. for Persons with Disabil.
9:40am:	(break)
**10:00am:	Team 9, "Improved Controller for Electric Motor", Airmaster Fan (multidisc. team), 10:00-10:55, **Lake Huron Rm
10:30am:	Team 2, "Quiescent ID Badge," Lear Corporation
10:55am:	Team 3, "Piezoelectric Transducer Characterization," Lear Corp.
11:20am:	Team 6, "Improved Beep Baseball," DaimlerChrysler and RCPD
11:55am:	Team 10, "ADHD Feedback Device," MediaBalance, Inc.
12:20pm:	(Lunch break for judges - lunch for others begins at noon)
1:00pm:	Team 7, "Electronic Ice Level Sensing," Whirlpool Corporation
1:25pm:	(ECE 480 judges deliberate)

EGR 291 robot competition

11:00am - 12:00noon, Second Floor, Concourse

Award Ceremony (joint with M.E.)

2:00pm, Second Floor, Ballroom, open to all. EGR 291 winners introduced, ECE 480 Prism Venture Prizes announced

COLLEGE OF ENGINEERING DESIGN DAY
Electrical and Computer Engineering Activities

ECE 480 – SENIOR CAPSTONE DESIGN – Prof. Erik Goodman, Instructor
 Featuring 25-minute presentations by each team

Faculty Facilitators for Fall, 2006:

Prof. Subir Biswas, Prof. Shantanu Chakrabartty, Prof. Hassan Khalil,

Prof. Karim Oweiss, Prof. Fang Zheng Peng, Prof. Pradeep Ramuhalli,

Prof. Fathi Salem, Prof. Elias Strangas, Prof. Peixin Zhong

Technical Support:

Brian Wright, Gregg Mulder, ECE Technical Services

Roxanne Peacock, Procurement

EGR 291 – FRESHMAN/SOPHOMORE SEMINAR – Pete Semig, Instructor
 Featuring a competition among robots programmed by student teams

CO-OP/INTERN PRESENTATIONS – Garth Motschenbacher, Coordinator
 Featuring a 15-minute presentation by each student

DESIGN DAY SUPPORT:

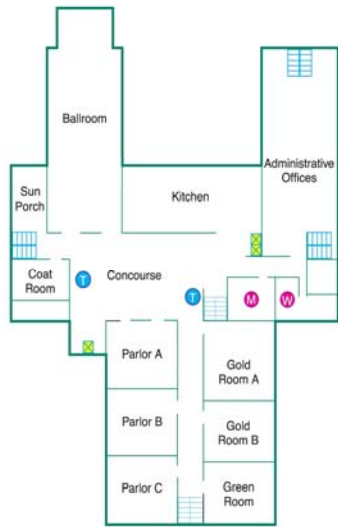
Vanessa Mitchner, ECE Program, Photography

Garth Motschenbacher, Logistics Coordinator

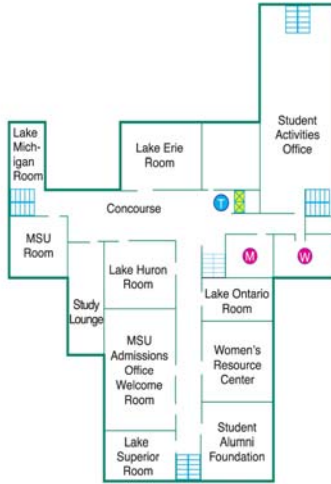
Iain Bogle, Program Cover Design

Thanks to Prof. Brian Thompson and his team for overall coordination of Design Day (and please see their program for additional information)!

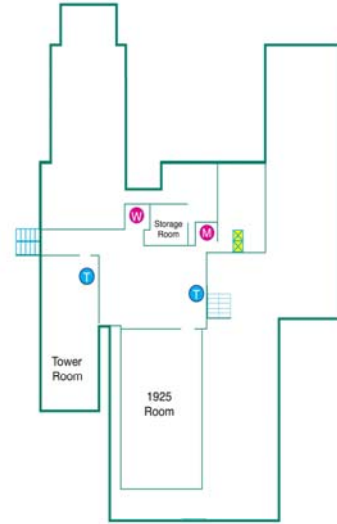
Fourth Floor		Third Floor						
Time	Tower Room	Lake Huron Room	Lake Erie Room	Lake Superior Room	MSU Room	Lake Ontario Room		
8:00	ME481 Project Presentations	ME481 Project Presentations	ME456 Project Presentations	ECE480 Project Presentations	9:00 start	ECE Co-op Presentations		
9:00				9:40 Interlude	Audio Enthusiasts and Engineers			
9:30								
10:00				ECE480 Project Presentations				
11:00			Lunch Second Floor Concourse					
12:00-1:00					ECE480 Project Presentations		Audio Enthusiasts and Engineers	ECE Co-op Presentations
1:00								
1:30								
2:00	Awards Ceremony in the Ballroom							



Second Floor



Third Floor



Fourth Floor



MSU Union Floor Plan

Second Floor						
Concourse	Gold Room A&B	Green Room	Parlor A	Parlor B	Parlor C	Ballroom
	9:00 start	9:00 start	9:00 start	9:00 start		
11:00 start	ME 371 Project Presentations	K-12 Pi-Tau-Sigma Lecture	ME 412 Competition	K-12 Design-Build-Test Project	ME481 & ECE 480 Poster Session and demonstration of prototypes	ME471 Competition and K-12 Design-Build-Test Project
ECE291 Robot Competition						
ECE291 Robot Competition					Posters and demonstration of prototypes	

EGR291—Freshmen/Sophomore Seminar Series

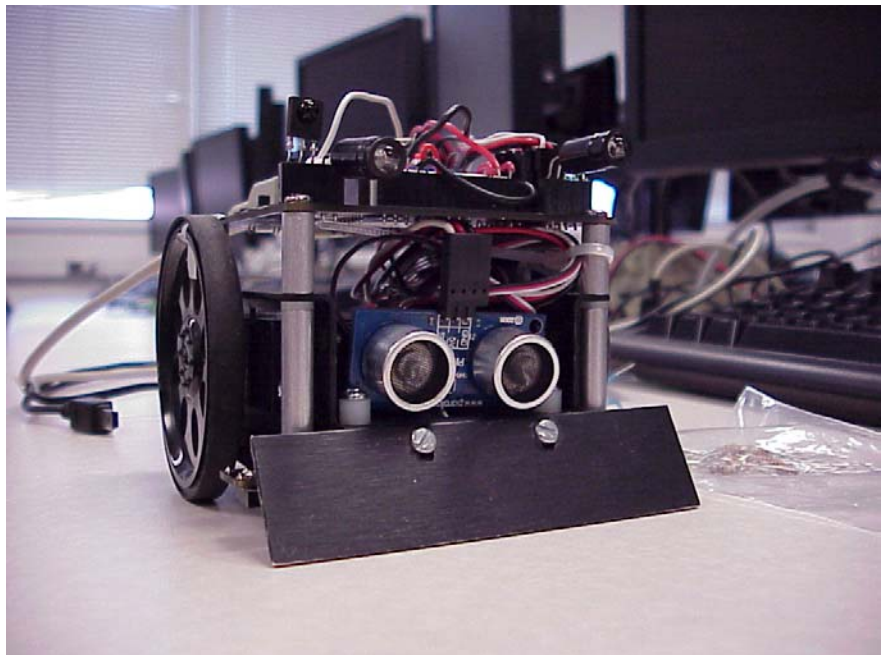
Instructor: Peter L. Semig Jr.

The purpose of EGR291 is to expose freshmen and sophomore students to the areas of Electrical & Computer Engineering through a series of guest lectures and hands-on laboratory experiments. Some of the guest lecturers include: Garth Motschenbacher (on resumes & interviewing), Niki Sancimino (Texas Instruments), Dr. P. David Fisher (police radar), and Dr. Leo Kempel (introduction to ECE). The hands-on experience is gained through weekly Basic Stamp microcontroller-based lab assignments.



Once the weekly lab assignments have been completed, the students are given a final project in which they must form groups to complete a task. This semester's competition will require the groups to program a Parallax robot to navigate an obstacle course.

Each robot is equipped with a variety of sensors, including an array of IR sensors to detect objects and to keep track of wheel position. It also has an ultrasonic sensor mounted on the front which can accurately determine distance to an object up to ten feet away. These are all coordinated by a BASIC Stamp microcontroller, integrated into the robot's PCB.



Design Day Presentations of Summer 2006 Co-ops/Internships
Lake Ontario Room
10:00 am – 2 pm, December 8th, 2006

Experience and credit! ECE students may earn academic credit, usually one credit per experience, for internships, co-op placements, independent student, undergraduate research experiences, and/or study abroad (excluding formal classroom instruction abroad treated as equivalent to MSU courses). In addition, a set of 3 – 4 of these experiences may substitute for one of the major elective courses required for graduation. To make this substitution, all of the experiences proposed for this must have been pre-approved for credit and all reporting requirements must have been satisfied and approved by their faculty mentor.



Pictured above: An MSU engineering student discusses a co-op opportunity with representatives of Dow Chemical at an MSU-sponsored Career Fair in the Breslin Center.

Oral Presentations: As part of the outcome assessment of this experience, all graduating seniors and/or students who have completed three or more experiences are asked to make an oral presentation describing their experiences. These are developed in

collaboration with their faculty mentors (each presentation is scheduled for about 15 minutes).

Dr. Aviyente's Students: Paul Anselmi - Lutron; *Emily Baker - GM; *Adam Bender - GM; Andrew Herman - Siemens; Ben Urban – Eaton Corporation

Dr. Biswas' Students: Jaeseung Shim - Signature Dist.; Muhammad Umar - MSU CARRS Dept.

Dr. Kempel's Students: * Erik Carr - Dept of Defense

Dr. Li's Students: *Travis Canfield, Stephen Patrick - MSU Power Plant; Invaad Natha - Intel; *Tania Yusaf – Delphi

Dr. McGough's Students: *Justin Cohen, *Heidi Zhang, Nick Tram - IBM; Rahul Mehta – GE

Dr. Mukkamala's Students: Gerald McCann - Delphi; Yuhei Uno - Honda; Junaid Zaheer - Johnson Controls

Dr. Oweiss's Students: Robyn Badon - CMS Consumers Energy; Joesph Kunesh - PCA; Nilay Shah - Marathon Ashland

Dr. Ramuhalli's Students: Christina Palm - Detroit Diesel; Paul Nuss - Innotec; *Kelly Quinn - GM; *Ram Venkatachalam - Whirlpool

Dr. Udpa's Students: * Nick Tokarz - Voith, Germany

Dr. Wierzba's Students: Katleen Reveitte – MATRIX

Dr. Zhong's Students: Truc Nguyen - Lockheed Martin; Kevin Scheel - Blue Cross/Blue Shield; Jason Payne - IBM; * Darren Ghiso - Pfizer; Natalie Hannon - Sircon Corporation

Students with a * are scheduled to present. Each presentation is scheduled for 15 minutes. These presentations are open to the public.

Senior Capstone Design Course

For All Electrical Engineering or Computer Engineering Majors at MSU

ECE 480 prepares students for the workplace, or for graduate school, including:

- *Putting into practice* the technical skills learned in the classroom, on industrially sponsored team projects, under faculty guidance, **doing open-ended design**
- Giving them experience in teamwork, project management, product life cycle management, legal, intellectual property, and accommodation issues, entrepreneurship, and other skills for the workplace. Each student has two roles on the team – a **technical role** and a **non-technical** role (manager, webmaster, document coordinator, presentation coordinator, or lab coordinator).
- Polishing their communication skills – individual and team – on proposals, reports, resumes, evaluations, posters, web pages, and oral presentations
- Challenging them to write about issues in engineering ethics and professionalism
- Requiring each individual to demonstrate competency in the lab by:
 - Building a digital circuit from discrete components
 - Building a microprocessor-based device, including programming and interfacing to the microprocessor
 - Programming a digital signal processing (DSP) chip for filtering
 - Writing a graphical user interface program

The Prism Venture Partners Prize

Recognizes the most outstanding capstone design projects each semester, including cash awards for members of the top three teams. Created by MSU alumnus Bill Seifert, of Prism Venture Partners in Boston, the prize is awarded at ECE Design Day by judges from industry who watch the teams' presentations, question the teams, and examine the prototypes.



Members of the Brooks Utility Products Group-sponsored team, winners of the Prism Venture Partners third prize, demonstrate their prototype for Mr. Stephen Blosser, of MSU's Artificial Language Laboratory and Resource Center for Persons with Disabilities. Mr. Blosser plays an important role for one or more teams each semester, as the technical contact for teams working on projects through the Resource Center for Persons with Disabilities, which are financially sponsored by a grant from Daimler Chrysler.

THANKS TO OUR SUPPORTERS!

ECE 480, Senior Capstone Design, is made possible by funding from many sources – tuition and student fees pay only a part of the cost.

Thanks, Industrial Sponsors!

Each team's industry sponsor helps cover the cost of the team. In addition, we are particularly grateful to the company engineers who help to define the problems, answer our students' questions, and provide them feedback on their progress.

ECE Design Day Sponsor



PrismVenturePartners

Generous support from Mr. Bill Seifert and the company in which he is a General Partner, Prism Venture Partners, funds not only the cash prizes, but also many of the other costs of Design Day. This support made it possible to found ECE Design Day as a public event three years ago, highlighting our students and their work to the community. It continues to help fund the new, combined College of Engineering Design Day.

DaimlerChrysler Grants Fund Projects for Persons with Disabilities

Grants from DaimlerChrysler have allowed teams each semester since spring, 2004 to address problems relating to persons with disabilities, even though the teams do not have another paying company sponsor. These projects are defined with the help of MSU's Resource Center for Persons with Disabilities and its Artificial Language Laboratory. Mr. Stephen Blosser has served as the customer liaison/advocate for these projects. Projects in 2004 included the talking dryer and the talking boating/fishing sensor system. In 2005, projects included a control panel accessibility evaluation tool project, a chordic keyboard project to help a user with cerebral palsy use his computer to produce speech, and design of exercise machines that are more accessible to persons with disabilities. Projects in 2006 included a device to assist a farmer with a disability in managing the filling of his grain elevators and the current semester's projects, beep baseball redesign and a wireless joystick for a user with cerebral palsy to use for speech synthesis.

DAIMLERCHRYSLER

Thanks, Judges!

The Department of Electrical and Computer Engineering thanks our judges for spring, 2006: Mr. Eric Becks (GXT Automotive), Mr. Steven Noll (Schiff-Hardin) and Mr. Jim Matt (GM R&D).

Companies—Want to sponsor a team?

Each fall and spring, ECE 480 teams need projects to work on – why not make one of them yours? Be a “customer” for our students. It gives you a great chance to look over five graduating seniors, and a chance to pursue “that idea you haven't had a chance to assign someone to.” To discuss, please email or call Erik Goodman, goodman@egr.msu.edu, (517)355-6453. We need to know of your interest at least a month before the semester starts (July for fall and early December for spring semester). The cost is minimal, and the time commitment by your company is small. Think about it!



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**ECE 480 SENIOR
CAPSTONE DESIGN**

**DESIGN TEAM #01
"Control System
Implementation for NASA
Robotic Arm"**

www.egr.msu.edu/classes/ece480/goodman/fall/group01/

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Michael A. Comberiate**



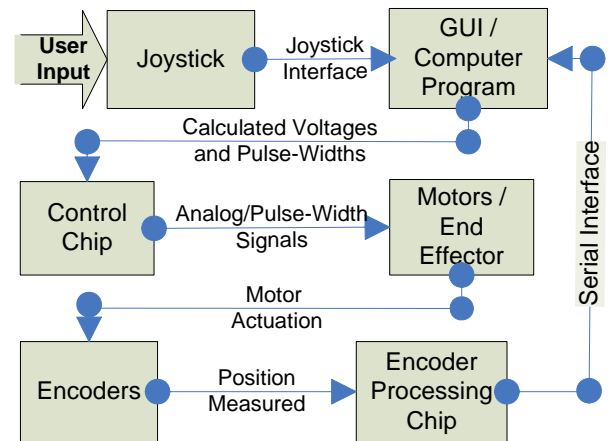
**Prof. Hassan Khalil
Faculty Facilitator**

CONTROL SYSTEM IMPLEMENTATION FOR NASA ROBOTIC ARM



Team 1 was given the opportunity to design and implement the control system for a robotic arm previously developed by NASA and MSU. The sponsor, NASA Goddard Space Flight Center,

plans to use the arm in conjunction with a previously designed mobile robot platform. For this reason, the control system developed had to be compatible with the robotic vehicle and run off its power supply. The control system has been designed to allow the arm to be controlled via joystick input, with visual feedback provided by a USB camera through the (Java-based) graphical user interface. In addition, a customized end-effector has been implemented to demonstrate the functionality of the arm. Absolute position encoders have been added at worm gear joints, eliminating the need for a home position. In addition, customized mounts for both the motors and encoders have been added.



Manager



Jon Noll

Webmaster



Kevin Briere

Doc. Prep.



Shannon Nicley

Present. Prep.



Dan Baker

Lab Coord



Robert Walsh

QUIESCENT IDENTIFICATION BADGE

Team 2 was assigned the task of designing a quiescent ID badge for locating an individual during an emergency situation. The badge is required to transmit at least 200 feet and must have a shelf life of five years. In an emergency, a wake-up signal is transmitted, after which the badge transmits data for two days. Lear Corporation hopes to put the badge into mass production for its employees and guests after the release of relevant battery and chip technology. The team's developments will be integrated into current employees' badges and new badges for Lear's guests.



The main challenge of this project was the limitation on size – a fully workable system that fit within a credit card-sized badge. Another difficulty was the unavailability of much of the desired technology, because most of it has not yet been released for public use. Ultimately, using a thin cell battery provided the necessary power for an intermittent (rather than continuous) signal, and fell within the size specification. The CC2430 SoC (System-on-Chip), a next-generation 2.4GHz ultra-low-power wireless transceiver with an integrated Texas Instruments microcontroller, is used. The chip could also perform other tasks, particularly temperature sensing, which Lear may later implement.

The chip could also perform other tasks, particularly temperature sensing, which Lear may later implement.



Manager



Adam Sanborn

Webmaster



Kyle Overall

Doc. Prep.



Justin Smith

Present. Prep.



Curtis Nichol

Lab Coord.



Matt Hofmann



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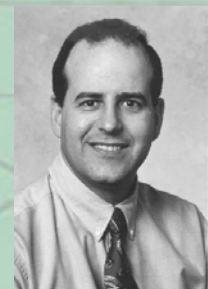
**ECE 480 SENIOR
CAPSTONE DESIGN**

**DESIGN TEAM #02
“Quiescent ID Badge”**

<http://www.egr.msu.edu/classes/ece480/goodman/fall/group02/>

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Lear Corporation**

**SPONSOR CONTACT:
Winston Maue**



**Fathi Salem
Faculty Facilitator**



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**ECE 480 SENIOR
CAPSTONE DESIGN**

**DESIGN TEAM #03
"Piezoelectric Transducer
Characterization"**

[www.egr.msu.edu/classes/
ece480/goodman/fall/group03/](http://www.egr.msu.edu/classes/ece480/goodman/fall/group03/)

**INDUSTRIAL SPONSOR
Lear Corporation**

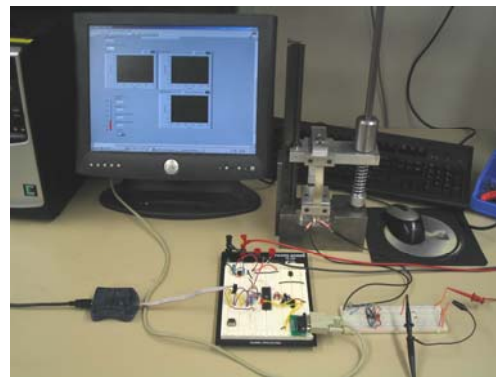
**SPONSOR CONTACT
Winston Maue**



**Subir Biswas
Faculty Facilitator**

PIEZOELECTRIC TRANSDUCER CHARACTERIZATION

Team 3 was assigned the task of characterizing a piezoelectric transducer. Lear Corporation supplied the piezoelectric material and the impacting rig. To characterize the material, our team will measure force, the first derivative of the force, and the second derivative of the force under different conditions. Resonant frequency and the bandwidth of this frequency will also need to be studied. In order to attain the data needed to characterize the material we will need to build a system that can record the status of the material through a variety of tests and conditions and analyze the resultant data with a computer interface.



All tests and procedures must be documented in order to be repeatable to ensure consistent results; also, Lear will be performing additional tests using our set of procedures. The results will be used to develop the means to implement the material used in sensors designed for future crash test mannequins.



LEAR[®]
CORPORATION

Manager



Jim Ellis

Webmaster



Devon Burder

Doc. Prep.



Paul Schmalenberg

Present. Prep.



Scott Hill

Lab Coord.



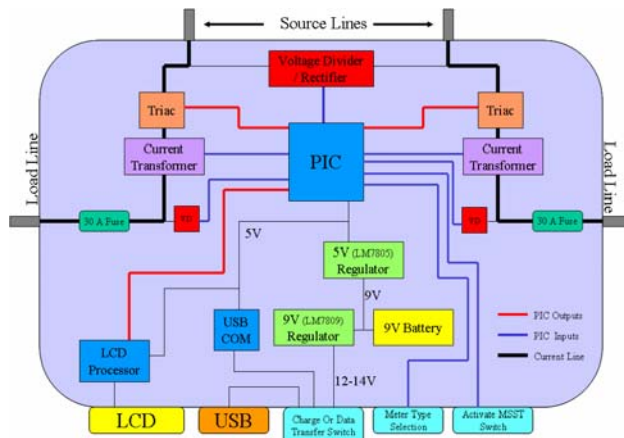
Dan Sheline

AUTOMATED METER SOCKET SAFETY TESTER



Since the birth of electricity as we know it, the watt-hour meter has played an integral role in tracking residential and commercial energy usage. In everyday situations such as when a customer does not pay energy bills or relocates, the electricity must be turned off, and the watt-hour meter un-installed. Before re-installation

of the meter can take place, there are many safety factors that must be considered. Given these safety concerns, the house or building to be metered should always be considered a "black box" when first approached by the meter technician. Currently there are a series of safety tests that the trained meter installer must run through, involving several different pieces of cumbersome equipment, The MSST project focuses on condensing these multiple test fixtures into one fully automated, micro-processor-based, low-cost, easy-to-use, error-proof digital testing unit that provides both outstanding performance and documented accuracy. This will open up a whole new era in meter socket safety testing for the installation personnel.

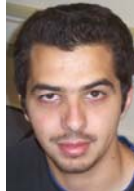


Manager



Paul Prinz

Webmaster



Hmoud Alabhoool

Doc. Prep.



Adam Bender

Present. Prep.



Claude Jinga

Lab Coord.



Ying Tan



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**ECE 480 SENIOR
CAPSTONE DESIGN**

**DESIGN TEAM #04
"Automated Meter
Socket Safety Tester"**

<http://www.egr.msu.edu/classes/ece480/goodman/fall/group04>

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**SPONSOR CONTACT:
Mr. Jeff Miller**



**Dr. Fang Zheng Peng
Faculty Facilitator**



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University**

**ECE 480 SENIOR
CAPSTONE DESIGN**

**DESIGN TEAM #05
"Improved Mouse
Controller"**

[www.egr.msu.edu/classes/
ece480/goodman/fall/group05/](http://www.egr.msu.edu/classes/ece480/goodman/fall/group05/)

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DaimlerChrysler
MSU Artificial Language
Laboratory, RCPD**

**SPONSOR CONTACT
Stephen Blosser**



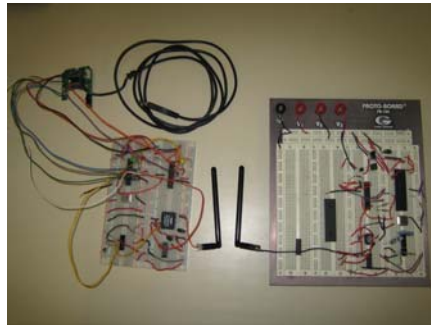
**Karim Oweiss
Faculty Facilitator**

IMPROVED MOUSE CONTROLLER

Team 5 was assigned the task of designing an improved mouse controller for a personal computer. Under a grant from DaimlerChrysler and with additional help from the MSU Artificial Language Laboratory, the team has worked to assist an individual with cerebral palsy, Jim Renuk, the IM Sports Coordinator at MSU, in



using a mouse for input to a speech synthesizer. Current mouse devices for personal computers require at least moderate fine motor skills. As a result, individuals with disabilities are often unable to use mice to navigate computer systems. The task is to design a device that emulates a computer mouse, but using a joystick-type mechanism. Desired features include variable cursor speeds, left and right click functionality, and double click options. Additionally, the device should be wireless and "plug-and-play." Two main components involved in this design are the detection of the joystick's



position and the processing of these signals to communicate cursor speed and direction to the personal computer. While this device was designed with Jim primarily in mind, the improved mouse controller could also benefit others with similar disabilities.

DAIMLERCHRYSLER



MSU Artificial Language Laboratory

Manager



Bryan Pietrzyk

Webmaster



Ruell Black

Doc. Prep.



Kevin Lorenz

Present. Prep.



Gugulethu Mabuza

Lab Coord.



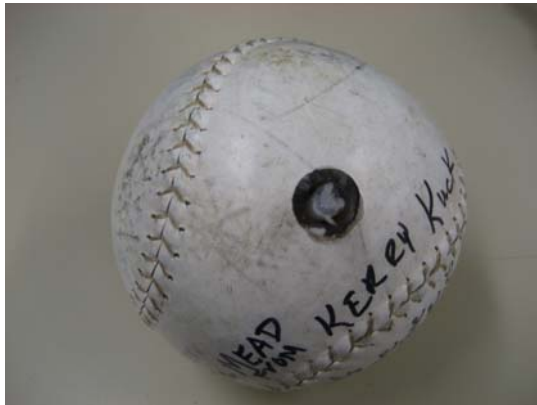
Steev Jean-Simon

IMPROVED BEEP BASEBALL



Team 6 was assigned the task of designing a new softball to be used in the game of beep baseball. The Rotary Club of Midland plans on using this ball to replace the current ball in production which is overly expensive, not very durable and perhaps could be made less injury-prone. Our sponsor requires that

the ball be lighter, preferably close to a half pound, and produce a beep of at least 90db at one foot. They also require an on/off mechanism and a recharging circuit to plug the ball into. The current ball is approximately one pound and lasts on average only six hits of the bat. It is our goal to produce a ball which will cost less and last the lifetime of a normal softball. In order to do this, we are redesigning the circuitry of the ball using two piezo buzzers along with a small micro-controller to control the frequency at which the ball beeps. We will then implant our circuit core into both a Chicago clincher softball and also a foam ball which we design, to find out which is preferred by the teams.



MSU Artificial Language Laboratory

DAIMLERCHRYSLER

Manager



Chris Mosser

Webmaster



Matt Morris

Doc. Prep.



Brian Naeger

Present. Prep.



Richard May

Lab Coord.



Gary Luu



Electrical and Computer
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Michigan State University

ECE 480 SENIOR
CAPSTONE DESIGN

DESIGN TEAM #06
"Improved Beep
Baseball"

[www.egr.msu.edu/classes/
ece480/goodman/fall/group06](http://www.egr.msu.edu/classes/ece480/goodman/fall/group06)

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SPONSOR CONTACT:
Stephen Blosser



Fathi Salem
Faculty Facilitator



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**ECE 480 SENIOR
CAPSTONE DESIGN**

**DESIGN TEAM #07
"Electronic Ice Level
Sensing"**

[www.egr.msu.edu/classes/
ece480/goodman/fall/group07/](http://www.egr.msu.edu/classes/ece480/goodman/fall/group07/)

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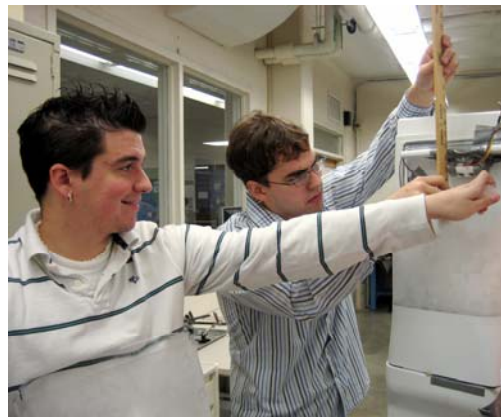
**SPONSOR CONTACTS
Matt Nibelink
Randy Jeffery
Kevin Chase**



**Pradeep Ramuhalli
Faculty Facilitator**

ELECTRONIC ICE LEVEL SENSING

Team 7 was assigned the task of designing an ice level sensing system that is able to detect the amount of ice in a bucket at any given time. With this ability, an algorithm will be used to adaptively produce only the amount of ice a consumer uses in a set time period. This new technology must work in conjunction with the existing functions of the refrigerator. The sponsor, Whirlpool Corporation, plans to incorporate this design in a variety of refrigerators in their production line. The sponsor's specifications will require a sensor to detect ice levels versus mere overflow, which is currently the extent of the technology. The solution must be cost effective in order to meet the mass production requirements set forth by the sponsor. This adaptive ice production will result in ice cubes that always have a fresh appearance and taste. Ice that remains stationary in the bin for long periods of time can become stale and clump together. This smart refrigerator will change the way the consumer experiences ice production.



Manager



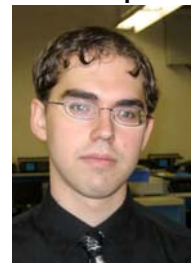
Erik Carr

Webmaster



Mauricio Gomes

Doc. Prep.



Alex Kuhn

Present. Prep.



Ben Crowgey

Lab Coord.



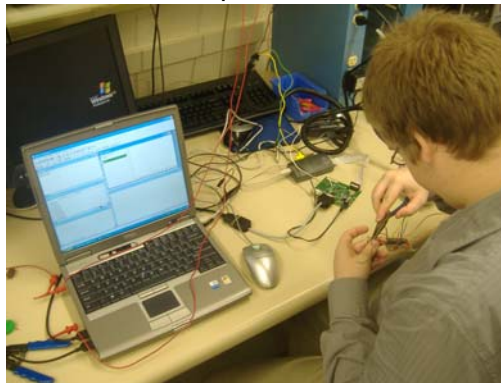
Jeff Zyla

CAN PROTOCOL INTERFACE FOR ENGINE ACTUATORS



Team 8 was assigned the task of developing a microprocessor-based device (Infineon C164) that will communicate control and diagnostics data between a PWM-based intake manifold actuator and an engine control computer, using the Controller Area Network (CAN) protocol. This project is a result of the Automotive Manufacturing direction to simplify the wire harness on an

engine, even though faced with an increasing number of sensors and actuators. This approach places the digitizing of the data into the sensor/actuator unit. The proof of concept will use a development board, an existing PWM-controlled actuator, and a PC. In addition to these specifications, Team 8 was asked to complete an additional task, if time allowed: using the existing PWM wave, replace the intake manifold by a DC motor controlled by CAN messages. This is to be completed using a Motorola 33887 H-Bridge Controller.



Travis Canfield
Manager



David R. Lenz
Webmaster



Matthew Griffen
Document Preparation



David Martin
Presentation Preparation



Michael Varney
Lab Coordinator



**Electrical and Computer
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Michigan State University**

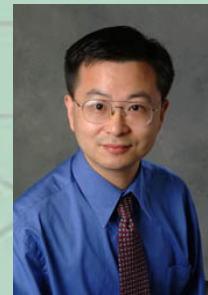
**ECE 480 SENIOR
CAPSTONE DESIGN**

**DESIGN TEAM #08
"CAN Protocol Interface
for Engine Actuators"**

www.egr.msu.edu/classes/ece480/goodman/fall/group08

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**SPONSOR CONTACTS:
Mike Racine
Paul Slaby**



**Peixin Zhong
Faculty Facilitator**

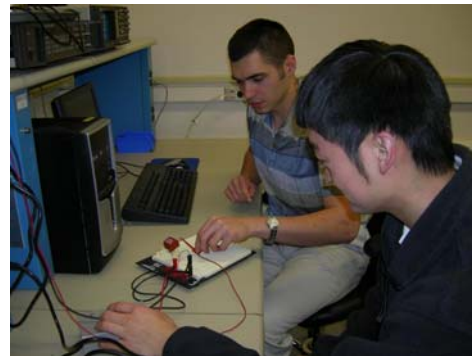


REDESIGNED CONTROL CIRCUIT FOR A BRUSHLESS DC MOTOR

Team 9 was assigned the task of redesigning the control circuit for a high-efficiency fractional-horsepower motor while maintaining a 90 percent efficiency or higher. The team was given an existing prototype of the motor driver circuit and was asked to find ways to make the circuit less expensive. The sponsor, Airmaster Fan Company, plans to sell the motor in the same market as less efficient induction motors. Our group has made use of a Programmable System on Chip (PSoC) from Cypress which will reduce the number of parts required on the current circuit. The PSoC will replace one micro-processor, nine integrated circuits, and more than ten resistors and capacitors, effectively reducing the board space requirement for a PCB. The PSoC will not immediately reduce the cost of parts in the circuit; however, more companies and industries are using the



PSoC every year, and this will bring the price of the chips down. This, along with the reduction in board space, will prove to reduce the cost of the overall circuit in years to come. Further, the PSoC chip provides Airmaster with the opportunity to include more features for their fans and/or more protection with its wide range of capabilities.



**Electrical and Computer Engineering
Michigan State University**

ECE 480 SENIOR CAPSTONE DESIGN

**DESIGN TEAM #09
"Redesigned Control Circuit for a Brushless DC Motor"**

www.egr.msu.edu/classes/ece480/goodman/fall/group09/

**INDUSTRIAL SPONSOR
Airmaster Fan Company**

**SPONSOR CONTACT
Bob LaZebnik**



**Elias Strangas
Faculty Facilitator**



Manager



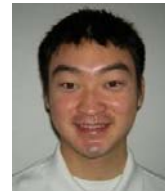
Anthony Recca

Webmaster



Katie Schmidt

Documentation Prep



Andy McIntyre

Presentation Prep



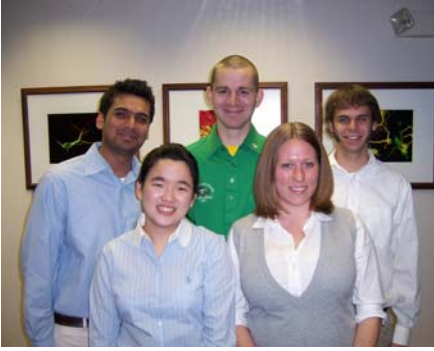
Mark Rosen

Lab Coordinator



Chad Gardner

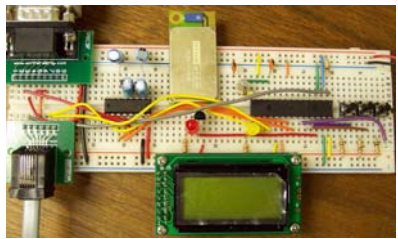
ATTENTION DEFICIT HYPERACTIVITY DISORDER FEEDBACK DEVICE



Team 10 is sponsored by Media-Balance, Inc. The task is to design a device which more meaningfully implements the features of a token economy as applied to the treatment of Attention Deficit Hyperactivity Disorder (ADHD). The device operates in a classroom setting to discreetly notify the wearer of any wirelessly received messages or

“points.” The feedback is immediate and therefore assists the user in discerning between positive and negative behaviors. When in an idle state, the device displays the current time and point accumulation. Additionally, the device is capable of storing the mood of the wearer as well as other events and, when prompted, downloads these data to a central PC for later evaluation.

The team’s work incorporates a Bluegiga Bluetooth module, an LCD, and a dsPIC microprocessor. Depending on the command received by the dsPIC it may compute a new point total or directly hand a message to the LCD for display. The internal EEPROM of the dsPIC was utilized to store up to two hundred time-stamped events. This reduced the device footprint by eliminating the need for an external memory device.



MediaBalance, Inc.
Wireless, Embedded Behavior Mod
333 Albert Avenue, Suite 425 East Lansing, MI 48823 (517) 333-7130
www.MediaBalance.biz

Manager



K. Burghardt

Webmaster



J. Wlodarczak

Doc. Prep.



S. Suwandi

Present. Prep.



H. Bharwani

Lab Coord.



J. Kelly



**Electrical and Computer
Engineering
Michigan State University**

**ECE 480 SENIOR
CAPSTONE DESIGN**

**DESIGN TEAM #10
“ADHD Feedback
Device”**

[www.egr.msu.edu/classes/
ece480/goodman/fall/group10](http://www.egr.msu.edu/classes/ece480/goodman/fall/group10)

**INDUSTRIAL SPONSOR
MediaBalance, Inc.**

**SPONSOR CONTACT:
Dr. Alex Terrazas**



**Shantanu Chakrabartty
Faculty Facilitator**

THANKS
TO



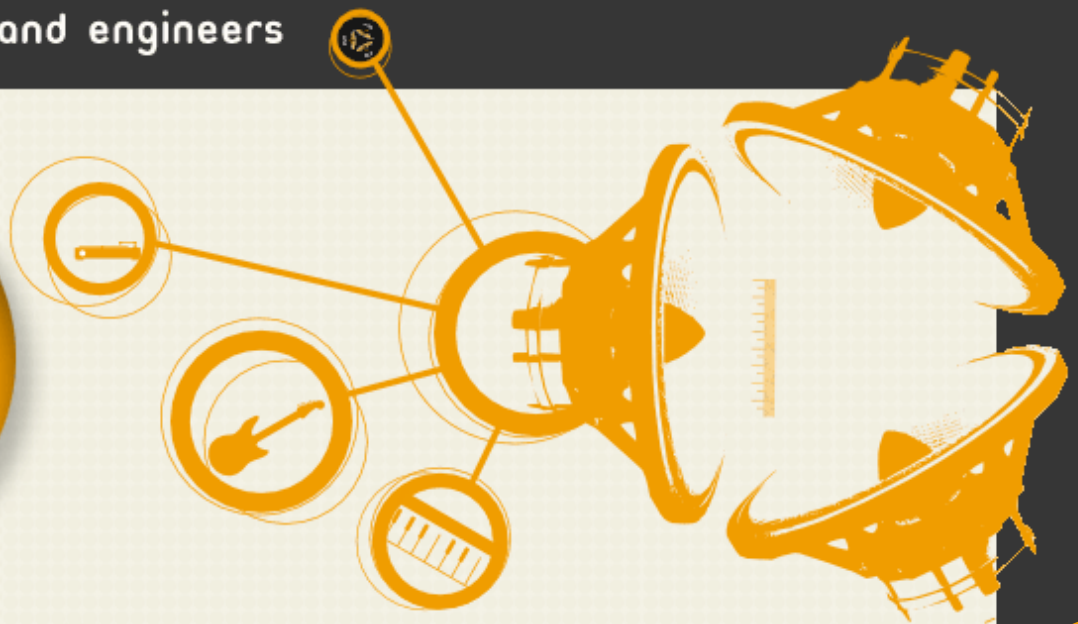
The Department of Electrical and Computer Engineering thanks Norfolk Southern for its generous financial support of Design Day. This support was used for production of this program and for other costs associated with Design Day, and for the infrastructure that allows our ECE Senior Capstone Design teams to work effectively on their industry problems.

Norfolk Southern Railway has a proud history, and today's NS includes not only the Norfolk and Western Railway and Southern Railway from which its name arose, but also all or large parts of many other historic railroads, such as the Pennsylvania Railroad, Nickel Plate Road, and Conrail. We are proud to have Norfolk Southern as a sponsor of Design Day! They recruit engineers (not locomotive engineers, but electrical engineers, computer engineers, etc.) at Michigan State University.



Team members [left to right] John Gregory, Syed Sajjad Ahmed, and Jacqueline Marushia-Laurain, of the Continental Teves team, show a visitor the prototype device they designed and built, during ECE Design Day, Spring, 2006. The “crash adapter” that they designed is able to simulate the sensor inputs from a real

crash, for use in testing whether seatbelt tighteners, airbags, etc., would deploy properly in a real crash, but without needing to damage a vehicle. They won First Prize in the Prism Venture Partners competition.



Audio Enthusiasts and Engineers is a brand-new student organization at Michigan State University College of Engineering. Comprised of students from many different majors, AEE strives to teach its members about Audio Engineering by designing, prototyping, testing and building audiophile-grade components.

This semester, AEE received a \$4,500 dollar grant from the Associated Students of Michigan State University (ASMSU) to complete their system. They also received \$1,000 grant from Aggie McCann Endowment for Student Activities to send select members to the 121st Audio Engineering Society Convention in San Francisco, California.

Come see them and their project in the MSU Room on Design Day, 2006 in the MSU Union



Members:

Faculty Advisor: Dr. Gregory M. Wierzba

Power Supply Team:

Joseph Hines
Geoff O'Donnell
Rollin Garcia

Pre-Amp Team:

Stas Todromovich
Mike Varney
Chad Gardner
Thomas Swartz
Stephen Zajac

Amplifier:

David R. Lenz
Dan Medore
Byung-mo Kang
Marquise Abbey

Speakers/Acoustics:

Eric Tarkleson
Jon Walby
Nicholas Strevel
Adam Eshkanian
Mark Blair
Devin Chard

Component Casing:

Borce Dilevski
Keith Tenbusch
Christopher Koliba
Mark Seal

GUI/LCD:

Mike Varney
Jerry McCann
Matthew Newman
Takahisa Nakahama

Special Thanks to the ASMSU Funding Board for funding our project

www.asmsu.msu.edu



PRISM VENTURE PARTNERS PRIZE WINNERS, SPRING 2006

The Prism Venture Partners Prizes (\$1,500, \$1,000, and \$500, for 1st, 2nd and 3rd places, respectively) are awarded each semester to the most outstanding teams in the Electrical and Computer Engineering Senior Capstone Design Course, as judged by a panel of engineers from industry. Another team is selected by the instructor to receive the Professor's Choice Award. You can see videos of all of LAST semester's teams' final oral presentations at <http://www.eqr.msu.edu/classes/ece480/goodman/finalpresentations/>



First place: Team # 09, “**Crash Adapter**” sponsored by **Continental Teves**.

LEFT TO RIGHT: Aaron Brown, Syed Sajjad Ahmed, Ming Han Chin, John Gregory, Jacqueline Marushia-Laurain and Professor Erik Goodman.

Second Place: Team # 07, “**BorgWarner Cooling System**” sponsored by **BorgWarner**.

LEFT TO RIGHT: Jordan Elzinga, Heidi Zhang, Lily Wang, Donald Dummer, Chhay Tep Kong, and Professor Erik Goodman



Third Place: Team #03, “**The Edge**” sponsored by **Brooks Utility Products Group**.

LEFT TO RIGHT: George Iseid, Lucas Hayward, Jarrett Gersten, Jason Crawforth, Joseph Kunesh and Professor Erik Goodman. (Not shown: Vang Kue)

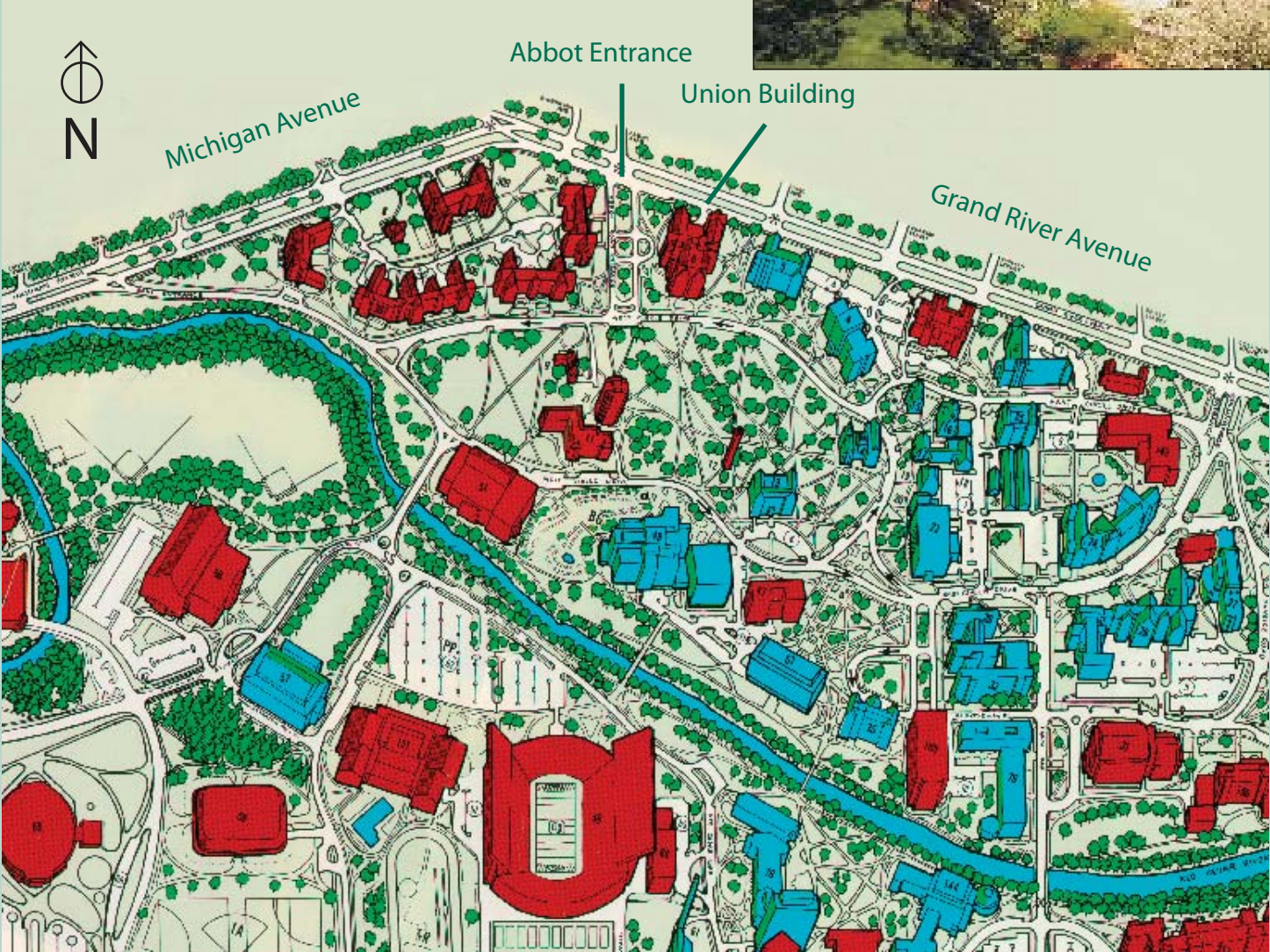


Professor's Choice Award: Team #01, “**Robot Locator System**” sponsored by **NASA – Goddard Space Flight Center**.

LEFT TO RIGHT: Benjamin DeGiulio, Michael Huntwork, Travis Bruns, Tony Cerri, Chet Chamberlin and Professor Erik Goodman



FINDING YOUR WAY TO THE UNION BUILDING...



Parking is available in lots and ramps north of Grand River Avenue in the downtown area of East Lansing and on campus in lots with parking attendants. Limited parking for visitors is available in metered areas on campus streets. Buses can park in the large lot south of the football stadium.

Michigan Automotive Compressor, Inc.



Airmaster



STATE OF MICHIGAN
DEPARTMENT OF LABOR & ECONOMIC GROWTH
OFFICE OF CAREER AND TECHNICAL PREPARATION



SOLAR CIRCLE



SINCE 1945



DART FOUNDATION



CASTER CONCEPTS

Beyond standard.

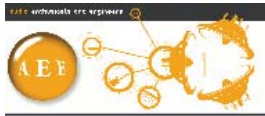


CapSnap

MIDBROOK COMMERCIAL DIVISION



GREYCELL
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Power Inc.

NORFOLK SOUTHERN

MICHIGAN STATE UNIVERSITY

