

The MSU College of Engineering

Design Day

Friday April 27, 2007

MICHIGAN STATE
UNIVERSITY

design 
program

A note from the **Design Coordinators**



Welcome to the MSU College of Engineering Design Day. The Departments of Electrical and Computer Engineering and Mechanical Engineering wish you a memorable day as our students demonstrate their amazing talents through design competitions, oral presentations, and posters. Design Day clearly demonstrates that MSU engineers are educated to lead, create, and innovate.

As you visit our activities, please meet and talk with our students and faculty. They are an incredible group of people who would love to share with you their accomplishments that are on display. To add further to the excitement of the day, approximately 300 middle school and high school students are participating in the Dart Foundation Day of Engineering Innovation and Creativity for 7th-12th Grade Students. The students will have the opportunity to explore engineering principles with hands-on projects that require the application of their creativity and ingenuity.

The headliners of the day are our graduating seniors as they present their Capstone Design projects through posters and oral presentations. These projects are the culmination of years of education and provide unique opportunities for the seniors to demonstrate all that they have learned.

Advancing knowledge

Transforming lives

Invigorating companies and communities

Design Day would not be possible without the generous support of our project sponsors and donors. Project sponsors provide not only funding, but more importantly, professional interaction as the “customers” of our design teams. Donors support both humanitarian projects and the operating costs of Design Day. We thank these sponsors and donors for their support: Airmaster Fan Company, Behr America, Boeing, BorgWarner, Bosch Automotive, Cummins & Barnard, DaimlerChrysler, Dart Foundation, Denso International America, Dow Chemical, General Electric, General Motors, Instrumented Sensor Technology, JMT Farms, Lear Corporation, Louis Padnos Iron and Metal, Macsteel Jackson Division, NASA Goddard Space Flight Center, Precision Prototype & Manufacturing, Press-Sure, Prism Venture Partners, Sennetech, Shell Oil Company, Stryker Corporation, Texas Instruments, UNESCO, and Whirlpool Corporation.

Please join us for the Design Day Awards ceremony in the Ballroom at 1:15pm. This is where we will honor our best.

Enjoy!

Erik D. Goodman
*Professor
Electrical and
Computer Engineering*

Timothy J. Hinds
*Academic Specialist
Mechanical Engineering*

Craig W. Somerton
*Associate Professor
Mechanical Engineering*

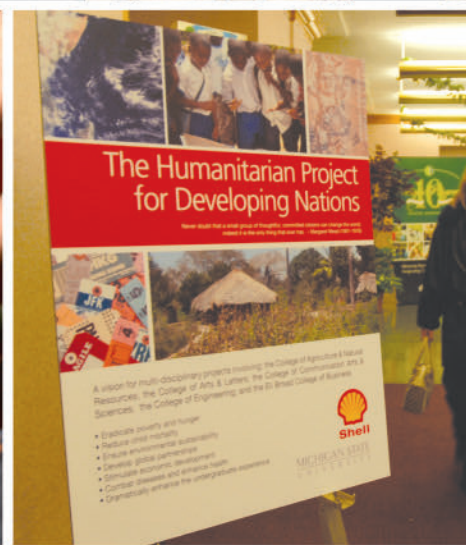
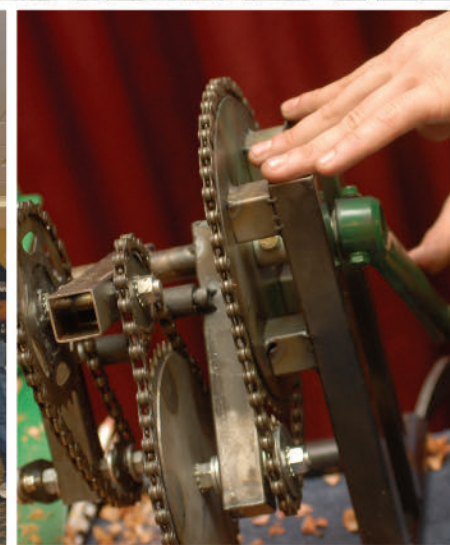
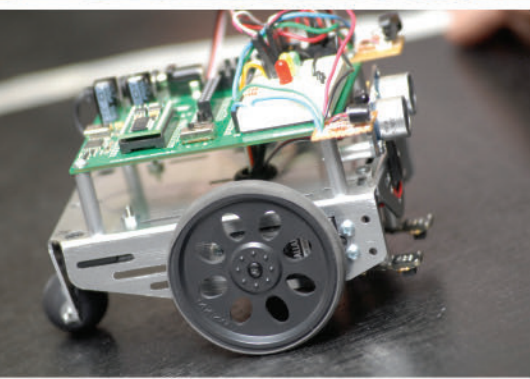


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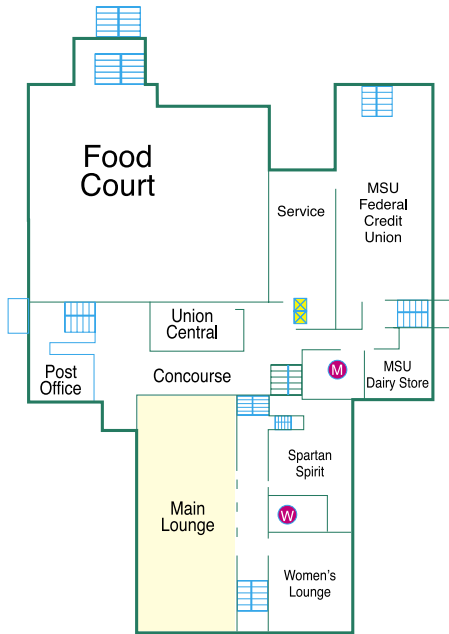


Conference Events Schedule: by time, event and room

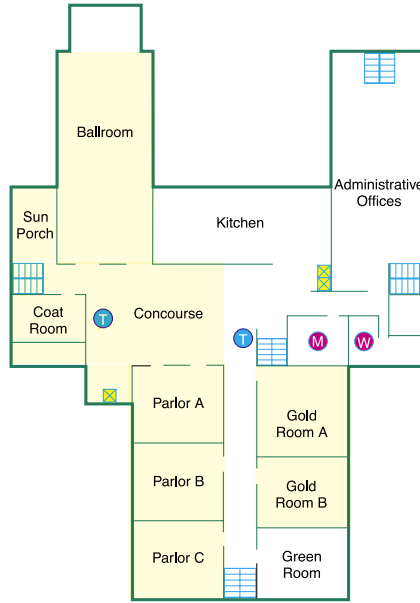
EVENTS	8:00 a.m.	9:00 a.m.	10:00 a.m.	11:00 a.m.	Noon	1:00 p.m.	2:00 p.m.
Grades 7-12 MSE Projects		Concourse (2nd floor) 9-10 a.m.					
EGR 291 Robot Competition			11 a.m.- noon	Concourse (2nd floor)			
ME 371 Project Presentations		Gold Room A & B (2nd Floor) 9 a.m. - noon					
Grades 7-12 Lecture		Green Room A & B (2nd Floor) 9 a.m. - noon					
ME 412 Competition		Parlor A (2nd Floor) 9 a.m. - noon					
Grades 7-12 Design/ Build/Test Competition		Parlor B (2nd Floor) 9 a.m. - noon					
		Parlor C (2nd Floor) 9 a.m. - noon					
ME 481/ ECE 480 Poster Session	Lounge (1st Floor) 8 a.m. - 12:30 p.m.						
ME 471 Competition		Ballroom (2nd Floor) 9 a.m. - noon					
ME 481/ ECE 480 Project Presentations	Lake Huron Room (3rd Floor) 8 a.m.-12:30 p.m.						
	Tower Room (4th Floor) 8 a.m.-12:30 p.m.						
	Lake Erie Room (3rd Floor) 8 a.m.-12:30 p.m.						
	Lake Superior Room (3rd Floor) 8 a.m.-12:30 p.m.						
Audio Enthusiasts & Engineers Demos		MSU Room (3rd Floor) 9 a.m.-12:30 p.m.					
ECE Co-op Presentations		Lake Ontario Room (3rd Floor) 9 a.m.-12:30 p.m.					
Grades 7-12 Awards			Ballroom (2nd Floor) 12-12:30 p.m.				
Lunch for all participants					2nd & 3rd floor concourse		
College Awards						Ballroom (2nd Floor) 1:15 p.m.-2:00 p.m.	

KEY: ME event ECE event Multi-department Grades 7-12

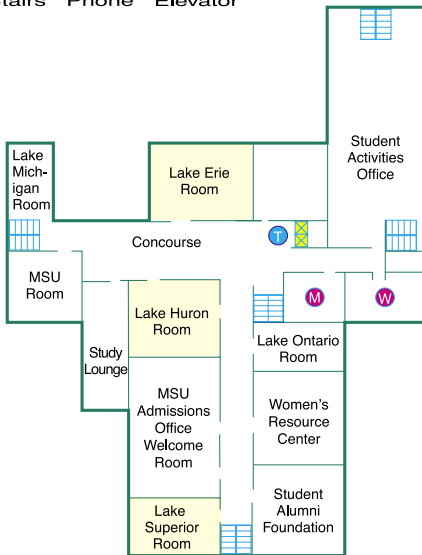
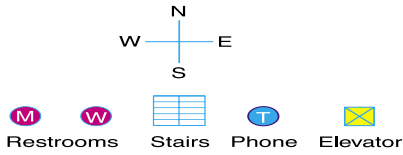
Conference Events Schedule: Floor Maps



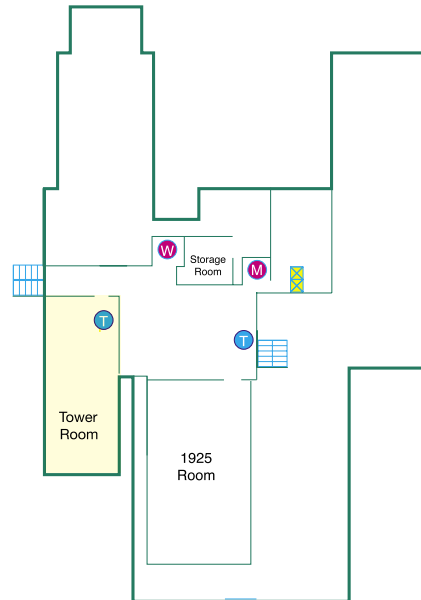
First Floor



Second Floor



Third Floor



Fourth Floor

MSU Union Floor Plan

MICHIGAN STATE
UNIVERSITY

April 2007

Dear Students, Family, Friends from Industry, Alumni, Faculty and Staff:

The College of Engineering's Design Day is an example of MSU at its best, where our outstanding students show their incredible talents and accomplishments. Hundreds of middle school and high school students learn about the excitement of engineering through seeing what MSU engineering students have done and through carrying out hands-on projects. This is an incredible event that highlights the accomplishments of our students, particularly our graduating seniors, and engages industry with the University.

The MSU Union bursts with energy as busloads of school kids, hundreds of MSU students, dozens of faculty members, and industry sponsors participate in the activities. The highlight of the event is the oral presentations and poster displays by seniors in the capstone design courses in mechanical engineering and in electrical and computer engineering. Many of the teams are multidisciplinary, involving students from different departments, colleges, and even different countries. Each student is a member of one of 37 teams that have designed a new or improved product or process for an industrial sponsor, most of which will have representatives at Design Day. Additional activities include competitions among MSU engineers in other courses and among the middle school and high school students working on their own engineering projects in the Union.



**OFFICE OF THE
PROVOST**

Michigan State University
Administration Building
East Lansing, Michigan
48824-1046
FAX: 517/355-9601

I am delighted to support this wonderful example of Michigan State University advancing knowledge and transforming lives.

Sincerely,

Kim A. Wilcox, Provost



*MSU is an affirmative-action,
equal-opportunity employer.*

College of Engineering Design Day: Spring 2007

STAFF ACKNOWLEDGEMENTS

ELECTRICAL & COMPUTER ENGINEERING:



Vanessa Mitchner



Garth
Motschenbacher



Gregg Mulder



Roxanne Peacock



Brian Wright

MECHANICAL ENGINEERING:



Roy Bailiff



Jill Bielawski



Craig Gunn



Eva Reiter

MACHINE SHOP AND DESIGN LAB STAFF:

Nathaniel Ellis
Dan Kline
Eliot Radcliffe
Trevor Ruckle
J.J. Westover

DESIGN DAY BROCHURE:

Design and layout by Blohm Ceative Partners,
East Lansing, MI. Design based in part
on an earlier design by Okemos Press,
East Lansing, Michigan

EGR 291

11:00 a.m. – Noon
Second Floor
Concourse



FRESHMAN/SOPHOMORE ECE ROBOT COMPETITION

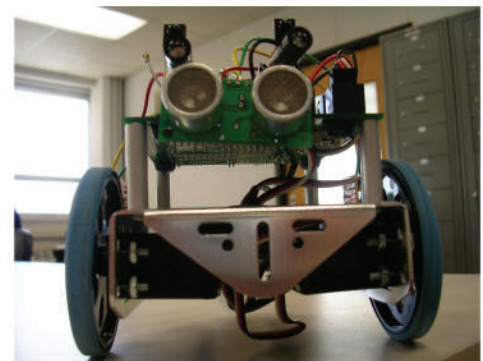
INSTRUCTOR:
Mr. Peter L. Semig Jr.

PROBLEM STATEMENT

EGR291 is an elective course that exposes freshman 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 (Resumes & Interviewing), Niki Sancimino (Texas Instruments), Dr. Fisher (Police Radar), and Trent Maier (Control Systems). 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 is to navigate a maze by controlling the robot with a Nintendo Wii-type controller.

The robots can be equipped with a variety of components and sensors, including IR sensors to detect objects, wheel positioning sensors, ultrasonic rangefinders, accelerometers, and RF receivers/transmitters. All component and sensor interaction is coordinated by a BASIC Stamp microcontroller, which is integrated into the robot's printed circuit board.



Freshman/Sophomore Teams

Team 1

Mike Balogh
Andrew Cawood

Team 2

Richard Link
Andrew Schonschack
Sarah Yang

Team 3

Corey Denuyl
Christian Gillman

Team 4

Mark Jones
Abdul Wahab Mahmood

Team 5

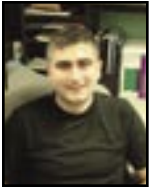
David Ninowski
Derek Grace

Team 6

Luke Heide
Steve Zuraski

Team 7

Sohaib Imran Rana
Ryan Laderach



PROTOTYPES OF DIVERSE MACHINES AND MECHANISMS

INSTRUCTOR:
Mr. Jimmy Issa

PROBLEM STATEMENT

Teams of students were required to design and manufacture machines and mechanisms using linkages, cams and gears to accomplish tasks selected by each team. These mechanical systems are displayed in conjunction with a poster session where students demonstrate these prototypical systems. Pre-college students will select the best designs by interviewing the ME 371 students. Subsequently, the winning team will be presented with the *Sparty Plaque* that was designed and built by students at Holt Junior High School.

Teams and members

Team 1

Brian Kunkel
Brian Smith
Adam Sneller
Boon Yong

Team 2

Adam Alderman
Nicole Arnold
Shangyun Shi
Jin Tam

Team 3

Christopher Caffee
Michael Cooper
Bradley Rutledge
Scott Slingerland

Team 4

Brandon Bouchard
Justin Bradford
Zachary Steffes
Ryan Stull

Team 5

Michael Booth
Kyle Koepf
Hani Kobty
John Woodruff

Team 6

Lisa Chapman
Chad Glinsky
Zachary McIntyre
Bryce Thelen

Team 7

Kevin Derrick
Luis Goncalves
Brent Rowland
Joshua Thomet

Team 8

William Hurles
Justin Milburn
Brandon Quaranto
Donald Snyder

Team 9

Anthony Carlo
Zef Ivanovic
Jane Kang
Keith Tenbusch

Team 10

Gerald Landry
Erik Marshall
Drew Mosner
Anwelli Okpue

Team 11

Martin Priess
Ryan Rieck
Lauren Sharp
Shaheen Shidfar
Richard Wahl



ME 412

8:00 – 11:30
Second Floor
Green Room



RANQUE-HILSCH VORTEX TUBE CHILLER

INSTRUCTOR: Professor Neil Wright

TA STAFF: Jayesh Kavathe, Anirban Lahiri,
Takesha Sattiewhite

PROBLEM STATEMENT

The *vortex tube chiller* has no moving parts, yet uses a single stream of high-pressure gas to produce one cold stream and one hot stream. These chillers are used, for example, to cool water for the crews of trains. Union rules state that the crews are to have access to cool water. Trains must have compressed air to run (so that the air brakes will work), and thus, if the train can run, the chiller will work. The chillers find other unique applications where compressed air is needed.

The student groups will design, analyze, and build a vortex tube chiller with a specified maximum temperature difference between the hot and cold sides. There are several designs for such a chiller, but the essence is to force air to swirl in a tube. The starting point will be a provided length of 1" PVC tubing, a couple of discs that fit inside the tubing, and a junction. The students may use other parts, if they wish.

Teams and members

Team 1

Scott Dosson
Jason Flanigan
Jacob Schulz
Chi-Hong Yung

Team 2

Scott Doyle
Wesley Fan
Jeremy Horgan
Matt Nagle

Team 3

Alexis Bauer
Andrew Gillett
Kacy King
Sean Steffer

Team 4

Brandon Gulker
Allison Lewis
Stacie Proctor
Andrew Schafer

Team 5

Basak Oguz
Sandip Suvedi
Richard Utrup
Steve Wagner

Team 6

Bryan Cooper
Michael Hundt
Uday Mathur
Ryan Spiekermann

Team 7

Ratikant Behera
Shantanu Joshi
Alejandro Recio-Sada

Team 8

Kathryn Anderson
Bethany Danielski
Matt Hirschfield
Chris Lowe

Team 9

Joe Affonso
Kyle Jose
Matt Radley
Chris Stevens

Team 10

Mark Ehrenberger
Sunghee Han
Matt Ryerkker
Wayne Steward

Team 11

George Elliot
Mary Martin
David Ruddock
Alison Wolters

Team 12

Matt Bauer
Matt Holley
Matt Langenderfer
Joy Reichenbach

Team 13

Nick Beechnau
Matt Hays
Aaron Smith
Matt Warner

Team 14

Tim Baumer
Agatha Bone
Melissa Carrier
Lindsey Verrier

Team 15

Chris Brzak
Dan Diebolt
Chad Kleinow
Jeff Mann

Team 16

Laura Beth Daly
Dan Cassar
James Lussman
Nancy Sidrak

Team 17

Seth Grua
Megan Lawrence
Matt Rokosz
Anita Solitro

Team 18

Adam Brannan
Joshua Ewing
Alex Grobbel
Michael McKimmy

ECE SUMMER & FALL CO-OP AND INTERNSHIP PRESENTATIONS

EXPERIENCE AND CREDIT!

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



Pictured left: An MSU engineering student discusses a co-op opportunity with representatives of Dow Chemical Company 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 presentations are developed in collaboration with their faculty mentors (each presentation is scheduled for about 15 minutes).

ECE Summer & Fall 2006 Co-ops and Internships: (listed by faculty mentor, showing students and companies)

Dr. Selin Aviyente's Students

Paul Anselmi - Lutron; *Emily Baker - GM;
*Adam Bender - GM; Andrew Herman -
Siemens; Ben Urban - Eaton Corporation

Dr. Subir Biswas' Students

Jaeseung Shim - Signature Dist.; Muhammad
Umar - MSU CARRS Dept.

Dr. Leo Kempel's Student

Erik Carr - Dept. of Defense

Dr. Tongtong Li's Students

*Travis Canfield, Stephen Patrick - MSU
Power Plant; Invaad Natha - Intel;
*Tania Yusaf - Lockheed Martin

Dr. Robert McGough's Students

*Jordan Cohen, Nick Tram, Heidi Zhang
- IBM; Rahul Mehta - GE

Dr. Rama Mukkamala's Students

*Greg Hatch - GE; Gerald McCann - Delphi;
Yuhei Uno - Honda; Junaid Zaheer - Johnson
Controls

Dr. Pradeep Ramuhalli's Students

Paul Nuss - Innotec; Christina Palm -
Detroit Diesel; *Kelly Quinn - GM;
*Ram Venkatachalam - Whirlpool

Dr. Lalita Udpa's Student

Nick Tokarz - Voith, Germany

Dr. Gregory Wierzba's Student

Kathleen Reveitte - MATRIX

Dr. Peixin Zhong's Students

Darren Ghiso - Pfizer; Natalie Hannon -
Sircon Corporation; Truc Nguyen - Lockheed
Martin; Jason Payne - IBM; Kevin Scheel
- Blue Cross/Blue Shield

*Students with a * are scheduled to present in
the Lake Ontario Room on Design Day. Each
presentation is scheduled for 15 minutes.
These presentations are open to the public.*

ME 471

9:00 – 11:45
Second Floor
Ballroom



Haddow



Pourboghrat

BASEBALL FRENZY

INSTRUCTORS: Professors Alan Haddow
and Farhang Pourboghrat

TA Staff: Zahid Rampurawala

PROBLEM STATEMENT

Students in the ME 471 course are challenged to design a device that will fire 30 *Official Little League* baseballs into 3 different targets. This must be done with no outside interference and within a 3-minute time period. The system must be powered by no more than 10 electromechanical devices (motors or solenoids), each running on 24 Volts or less with a maximum power consumption of 50 Watts. Before the beginning of the competition run, the system must be put into place at the prescribed starting location and the students are given 5 minutes to ready and test their device. After the device has been readied, a start signal will be given to activate the system. Once the system is activated, no external communication, interaction, or influence of any kind is allowed (i.e., the system must be completely autonomous). The system is allowed up to 3 minutes to toss the baseballs, one at a time, at three targets. All of the baseballs must be aimed and propelled by a single apparatus. The aiming part of this apparatus must change with the target selected. Students will be given the opportunity to run their system twice during the course of the morning.

Time	Station	Team Members
9:00	1	Patrick Grondin, Jillian Joliat, Matthew Langenderfer
9:05	2	Anthony Piro, Sylwia Poplawska, Keith Srebinski, Ryan Taelman
9:10	1	Evan Detone, Patrick Eathorne, Jason, Franklin
9:15	2	Andrew Abramowski, Aaron Hall, Joseph Obeidi
9:20	1	Richard Henderson, Lindsay Kredon, Justin McIver
9:25	2	Nicholas Rowe, Kyle Szytykiel, Jacob Wagner
9:30	1	Aaron Butler, Patrick Cadigan, Michael Hundt
9:35	2	Evan Marks, Elliott Radcliffe, Daniel Raphael, Elliot Tippmann
9:40	1	Michael Fong, Ryan Wahula, Taylor Young
9:45	2	Kalpen Gandhi, Lane Taber, Scott Wiltz
9:50	1	Josh Maniago, Mohd Mokhtar, Mohd Salim
9:55	2	Alexander Bellinson, Arjang Gouneili, Adam Grisdale
10:00	1	Erin Johnson, David Klipfel, Daniel Little
10:05	2	Michael Gyetvai, Brett Hollier, Lindsay Bockstiegel
10:10	1	Alexander Kerstein, Blake Gower, Jonathon Ostroski
10:25	2	Patrick Grondin, Jillian Joliat, Matthew Langenderfer
10:30	1	Anthony Piro, Sylwia Poplawska, Keith Srebinski, Ryan Taelman

Time	Station	Team Members
10:35	2	Evan Detone, Patrick Eathorne, Jason, Franklin
10:40	1	Andrew Abramowski, Aaron Hall, Joseph Obeidi
10:45	2	Richard Henderson, Lindsay Kredon, Justin McIver
10:50	1	Nicholas Rowe, Kyle Szytykiel, Jacob Wagner
10:55	2	Aaron Butler, Patrick Cadigan, Michael Hundt
11:00	1	Evan Marks, Elliott Radcliffe, Daniel Raphael, Elliot Tippmann
11:05	2	Michael Fong, Ryan Wahula, Taylor Young
11:10	1	Kalpen Gandhi, Lane Taber, Scott Wiltz
11:15	2	Josh Maniago, Mohd Mokhtar, Mohd Salim
11:20	1	Alexander Bellinson, Arjang Gouneili, Adam Grisdale
11:25	2	Erin Johnson, David Klipfel, Daniel Little
11:30	1	Michael Gyetvai, Brett Hollier, Lindsay Bockstiegel
11:35	2	Alexander Kerstein, Blake Gower, Jonathon Ostroski



ECE 480 Senior Capstone Design

Instructor: Erik Goodman

ECE 480 is required of all electrical engineering or computer engineering majors at MSU. It 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 in lectures with Prof. Elias Strangas.
- Requiring each individual to demonstrate competency in the lab by:
 - o Building a digital circuit from discrete components
 - o Building a microprocessor-based device, including programming and interfacing to the microprocessor
 - o Programming a digital signal processing (DSP) chip for filtering
 - o Writing a graphical user interface program
- Giving many of them experience teaming with engineers from other disciplines.

ME 481 Mechanical Engineering Design Projects

Instructors: Timothy Hinds and Craig Somerton

ME481 is required for all mechanical engineering majors at MSU.

The focus of ME481 is to provide students with a team-based capstone design experience. In these projects, students use the technical expertise, communication skills, and teaming methodologies they have learned throughout their mechanical engineering curriculum, along with their creativity, to solve real world problems.

Many of these problems are sponsored by industry and provide students with the opportunity to collaborate with practicing engineers. Typical projects include development of new products or re-design of existing products to reduce costs or enhance reliability. Projects have involved interaction with large, medium-sized and small companies in industries ranging from orthodontic devices, furniture, aerospace structures and automotive to consumer electronics, materials recycling, food processing and machine tools.

Other projects are humanitarian based, in which the students work with individuals who have special challenges. These projects are focused on the development of devices to improve the quality of life for children affected by diseases like cerebral palsy or meningococemia.

The student team oral presentations and poster displays at Design Day serve as the culmination of these endeavors.

The moral test of a society is how that society treats those who are at the dawn of life – the children; those who are in the twilight of life – the elderly; and those who are in the shadows of life – the sick, the needy, and the handicapped.

– Hubert H. Humphrey (1911 – 1978)

THE SHELL CHILDREN'S HUMANITARIAN PROJECT

In the fall of 1998, humanitarian projects were added to the diverse set of options offered to students registered for the ME481 Capstone Design Projects Course. These special projects have triggered the development of unique devices to improve the quality of life for children affected by a range of diseases such as cerebral palsy or static encephalopathy.

This humanitarian initiative is part of a more eclectic, broader educational directive – one that extends beyond the confines of the classical engineering curriculum to include character development, leadership, citizenship, and service. With these types of projects, our students abundantly give of themselves in an emotionally charged environment but they are in turn showered with the numerous gifts associated with service to other human beings.

These projects require considerable entrepreneurial spirit, inventiveness, and of course, considerable innovation because they

Our task is not to make merely better farmers, or veterinarians, or engineers, but better citizens; capable of appreciating the finer things in life, able and willing to take their part in shaping the destiny of their country.

John A. Hannah (1902–1991)
12th President of MSU (1941–1969)



lack the dedicated support of a commercial enterprise: a manufacturer. However it is this very thing, this practical innovation, which was primarily responsible for America becoming preeminent while other nations failed. Thus we strive to foster that traditional American ingenuity that has served us so well for over 200 years!

In the past, these projects have been unfunded; but we are now delighted to announce that the Shell Oil Company has decided to underwrite this segment of our Design Program. We heartily applaud their generosity and the implicit vision in their decision! On behalf of all the children who will benefit from this donation, and of course their parents, who will witness the recovery, or enhanced performance, of their child: *Thank you!*



LAKE SUPERIOR ROOM SCHEDULE: ECE480 SENIOR CAPSTONE DESIGN PROJECTS AND ME481 MECHANICAL ENGINEERING DESIGN PROJECTS

PRESENTATION SCHEDULE — Lake Superior Room

Course Coordinators: Dr. Erik Goodman, Mr. Timothy Hinds and Dr. Craig Somerton

Faculty Facilitators: Professors Ayres, Deller, Jaber, Li, Mahapatra, McGough, Müller, Oweiss, Radha and Shanblatt

Time & Location	Project Sponsor	Sponsor Contact(s)	Faculty Facilitator	Team and Project Title
8:00 Lake Superior ECE480	Instrumented Sensor Technology	G. Hoshal	J. Deller	Team 12: RMS G-meter
8:25 Lake Superior ECE480	Sennetech	J. Senneker	N. Mahapatra	Team 13: Digital telephone answering machine system
8:50 Lake Superior ECE480	NASA Goddard Space Flight Center	M. Comberiate	K. Oweiss	Team 1: Autonomous docking for a robotic arm
9:15 Lake Superior ECE480	NASA Goddard Space Flight Center	M. Comberiate	H. Radha	Team 2: Autonomous terrain mapping for robotic exploration
10:00 Lake Superior ECE480	DaimlerChrysler UNESCO		T. Li	Team 4: Mondialogo contest remote diagnosis system
10:25 Lake Superior ECE480	Texas Instruments	T. Adcock K. Gutierrez M. Mitchell	M. Shanblatt	Team 9: Low-cost wireless headphones
10:50 Lake Superior ECE480	Bosch	S. Gladstein C. Rostamzadeh	R. McGough	Team 15: Active EMI filter design
11:15 Lake Superior ECE480	Lear Corporation	W. Maue J. Nathan	V. Ayres	Team 3: Extended studies in piezoelectric transducer characterization
11:40 Lake Superior ME 481	Cummins & Barnard, Inc.	S. Herrygers C. Zuelch	F. Jaber	Technical assesment for reducing CO ₂ emissions
12:05 Lake Superior ME 481	DaimlerChrysler	G. Kontantakopoulos	N. Müller	Low-cost “in-car” automotive refrigerator

RMS G-METER

Team 12 was assigned the task of developing a microprocessor-based device that displays and updates in real time the RMS values of the acceleration levels to which it, itself, is exposed, in one axial direction. *Instrumented Sensor Technology* required that this device consist of a single-axis accelerometer, signal conditioning/filtering, A/D converter, micro-controller, LCD display, and battery power supply.

The user may first select either Peak mode, Average mode, or Integrated RMS mode. In the Peak Mode, the device updates the highest RMS value it has measured since it was activated. In the Average mode, the device simply displays the averaged RMS value of the acceleration signal over the entire time it has been active. In the Integrated RMS mode it reports the summed total of all RMS samples computed since activation.

This G-meter has useful industrial applications in machinery monitoring, turbine vibration monitoring, paper mill vibration monitoring, industrial package testing, packaging ship testing (for vibration exposure), and various types of shock and impact testing, where a simple real-time display of the test data is adequate.

<http://www.egr.msu.edu/classes/ece480/goodman/spring/group12/>



A. Eshkanian
Electrical Egr

A. Young
Electrical Egr

C. Stewart
Electrical Egr



O. Bennani
Electrical Egr



T. Nakahama
Electrical Egr



Dr. Deller



Project Sponsor
Instrumented Sensor Technology, Inc.

Takahisa Nakahama
Lab Coordinator

Sponsor Representative
Mr. Greg Hoshal

Adam Young
Webmaster

Faculty Facilitator
Dr. John R. (Jack) Deller, Jr.

Adam Eshkanian
Documentation Preparation

Team Members and Non-technical Roles
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Manager

Cammi Stewart
Presentation Preparation

DIGITAL TELEPHONE ANSWERING MACHINE SYSTEM

Team 13 was tasked to build an improved digital telephone answering machine system. The desired improvements were the ability to “rewind” the message to a certain point, and the audio quality of the playback. Current digital answering machines typically suffer from poor audio quality, and allow the user only to replay an entire message, rather than being able to “rewind” a small amount to listen to a name or number again, for example.

One of many improvements to be integrated in the answering machine system is a friendly graphical user interface. Using a touch-screen LCD for the human interaction, the answering machine will be part of an in-home control unit.

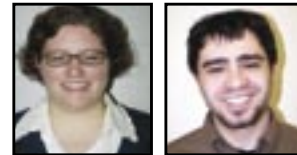
The answering machine will be able to record and play back phone messages with superb quality locally, or can even integrate the audio messaging into an in-home intercom system, using a central computer that monitors the whole house. The user will be able to rewind messages as they are playing to any desired part just by touching the corresponding point on a graphic depiction of the message on the interactive LCD screen. The answering machine will also be able to store messages to a local or central home computer, using a USB connection.



N. Decia
Electrical Egr

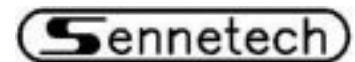
M. Magee
Electrical Egr

T. Peterson
Electrical Egr



K. Revitte
Electrical Egr

S. Todromovich
Electrical Egr



Project Sponsor
Sennetech, Inc.

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Trevor Peterson
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Stanislav Todromovich
Presentation Preparation



Dr. Mahapatra

AUTONOMOUS DOCKING FOR A ROBOTIC ARM

Team I was asked to implement autonomous docking for a robotic arm that was developed by NASA and previous MSU design teams. Our sponsor, NASA Goddard Space Flight Center, plans to use the arm in conjunction with a NASA mobile robot platform.

Before autonomous docking could be implemented, various improvements to the current arm were necessary. These improvements included: adding a planetary gearbox at the elbow joint as well as other mechanical improvements, improving the reliability of the joystick, redoing the inverse kinematics, and troubleshooting the servos and circuitry. With these improvements, the arm movements became reliable and accurate enough for autonomous docking.

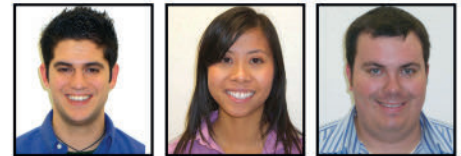
Proximity and retro-reflective sensors were integrated with the microcontroller and end effector for use in docking. A software program was created to retrieve sensor data and translate the data into a docking procedure so that the arm could complete docking without human intervention. The graphical user interface was modified to make it more user friendly as well as to incorporate autonomous docking, which was then translated into an application that allows the arm to be controlled via the internet.

Autonomous docking is ideal for situations and environments which are not suitable for humans. It can provide a level of precision, reliability, and functionality that human involvement may lack.

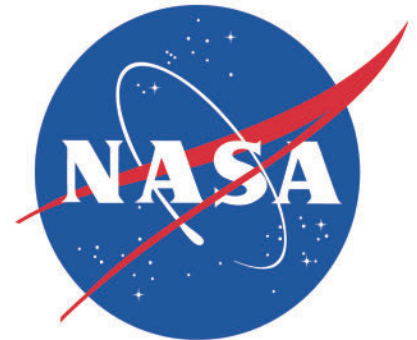
Project website: www.egr.msu.edu/classes/ece480/goodman/spring/group01/



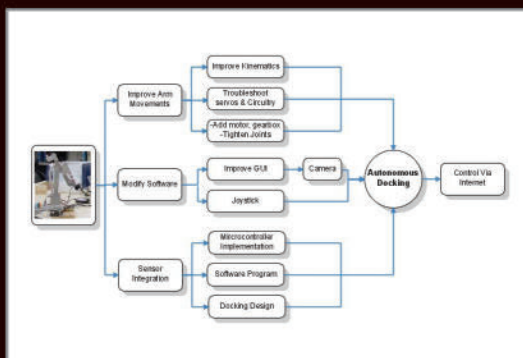
J. Marus Computer Egr
J. Baumgardner Computer Egr
K. King Mechanical Egr



N. Tokarz Electrical Egr
T. Nguyen Computer Egr
K. Ortman Mechanical Egr



Dr. Oweiss



Project Sponsor
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Truc Nguyen
ECE Lab Coordinator



AUTONOMOUS TERRAIN MAPPING FOR ROBOTIC EXPLORATION

As robotic exploration of space and potentially dangerous environments is becoming more common, it is necessary to develop novel methods for utilizing this new technology from safe distances. In an effort to develop a method for autonomous navigation of potentially very distant or dangerous environments, Team 2, under the guidance of *NASA Goddard Space Flight Center*, explored the use of an iterative closest point algorithm for creating a three-dimensional representation of unknown terrain.

Tracking the relative rotation and translation of a mobile robot between depth scans makes it possible to approximate the alignment between successive images. This approximated alignment can then be used with an iterative closest point algorithm to create a three-dimensional mosaic of the environment, which can be transferred through wireless connections to an end user for viewing. By storing map information as it is generated and using path-finding algorithms, the mobile robot is able to make “educated” decisions regarding the most informative and safest route for its next exploration movement.

After successfully mapping a designated area and generating a three-dimensional representation, the mobile unit can convey this information to an end user which they can then use to make informed decisions on how to interact, through the mobile robot, with an environment that would otherwise be inaccessible. Utilizing mobile robots will make it possible to explore distant planets, buildings with high levels of chemical hazard and disaster areas that are highly unstable, all with relatively low risk.

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



D. Merritt
Electrical Egr



J. Pita
Computer Sci



N. Furtwangler
Computer Egr



R. Ferguson
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T. Wall
Computer Sci



Project Sponsor
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Nathan Furtwangler
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James Pita
Presentation Preparation



Dr. Radha

MONDIALOGO CONTEST REMOTE DIAGNOSIS SYSTEM

Our design team is participating in the Mondialogo Engineering Award contest, jointly run by UNESCO and DaimlerChrysler. For this contest, which ends on May 31, 2007, teams from developed and developing countries work together on projects that will improve the quality of life in developing countries.

Our partners, a team of six undergraduate electrical engineers in China and two graduate biomedical engineers in Italy, are working with us to address the issue of affordable health care in China. Lack of health insurance, especially in rural areas, prevents many Chinese people from seeking medical care. Therefore, many potentially serious symptoms are detected late or not at all.

Together we have developed a multifunctional biomedical measurement device that will help detect symptoms at no cost to the patients. Available for free use in rural hospital lobbies, the device is simple, safe, and robust enough to be operated by trained volunteers or even by the patients themselves. A primarily picture-based GUI directs users in the operation of each module, and a database tracks patient data. Integration of the individual modules to communicate with a central processor represents the most significant technical challenge.

The following modules are implemented:

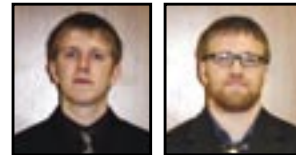
- Blood pressure measurement – MSU group
- Electrocardiogram (ECG) – HuaZhong group
- Oxygen saturation measurement – HuaZhong and Bologna groups
- Temperature measurement – MSU group
- Blood sugar measurement – MSU group
- Wireless infusion bottle warning system – HuaZhong group (automatically warns when infusion bottles are about to run out)



J. Shane
Electrical Egr

J. Hines
Electrical Egr

K. Scheel
Computer Egr



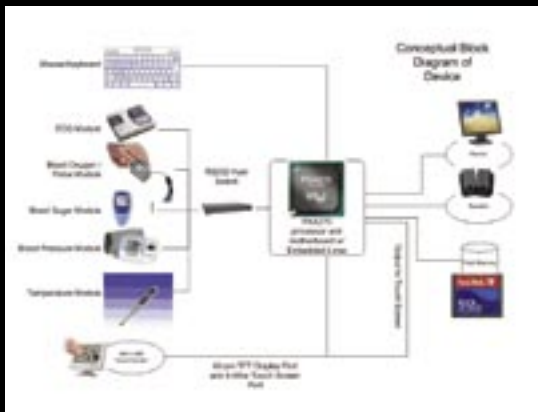
K. Hessler
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T. Wa-Jiw Casey
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DAIMLERCHRYSLER



Dr. Li



Project Sponsors
DaimlerChrysler and UNESCO

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Presentation Preparation

Thomas Wa-jiw Casey
Lab Coordinator

LOW-COST WIRELESS HEADPHONES

Team 9's sponsor, *Texas Instruments*, gave them the task of creating wireless headphones. The headphones were required to be low-cost, low-power, and designed using *TI* microcontrollers. A range of 30 feet was expected between the transmitter and the receiver. The system was expected to operate for a minimum of three hours using small batteries. The team's solution incorporated two MSP430 microcontrollers with Chipcon RF transceivers. In order to realize the low-cost, low-power solution, sound fidelity was sacrificed compared to higher cost wireless solutions on the market.

Figure 1 is a simple block diagram describing the steps involved in the team's wireless solution. Analog input from the audio source is first passed through a low-pass filter to eliminate frequencies the human ear cannot hear. The microcontroller is then used for analog-to-digital conversion. The digital signal created is then compressed within the microcontroller. Using the transceiver, packets are sent over a wireless channel. Once received, the packets are decompressed in the second microcontroller. The digital signal is converted using a digital-to-analog converter from the microcontroller. The analog signal is then amplified to the correct audio range before being played back in the headphone.

Team 9's solution maximized the use of onboard memory and embedded peripherals of the microcontroller to create the system. By using efficient compression algorithms, low-power transceivers and microcontrollers, team nine was able to meet the design goals from *Texas Instruments* for the creation of inexpensive wireless headphones.

<http://www.egr.msu.edu/classes/ece480/goodman/spring/group09/>



B. Feeny
Computer Egr
B. Martin
Electrical Egr
B. Moretti
Electrical Egr



P. Feeny
Computer Egr
G. O'Donnell
Electrical Egr



Project Sponsor
Texas Instruments
Incorporated

Sponsor Representative
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Mr. Keith Gutierrez
Mr. Mike Mitchell

Faculty Facilitator
Dr. Michael Shanblatt

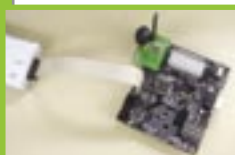
Team Members and Non-technical Roles
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Patrick Feeny
Lab Coordinator

Brunno Moretti
Webmaster

Brian Feeny
Documentation Preparation

Brian Martin
Presentation Preparation



Dr. Shanblatt

ACTIVE EMI FILTER DESIGN

As automotive technology has evolved, a variety of critical (anti-lock brakes, air bags etc.) and non-critical (onboard GPS) electrical modules have been installed in the typical automobile. The installation of these electrical modules has greatly increased the risk of harmful electrical interference. It is crucial that these electrical modules operate compatibly with each other in an increasingly congested electromagnetic environment. One way to ensure module compatibility is by using electrical filters to reduce the noise conducted between modules via the vehicle wiring.

Robert Bosch Corporation assigned Team 15 the task of designing an active electromagnetic interference (EMI) filter to reduce the conducted emissions of a high-current pulse width modulation (PWM) controlled DC motor. The filter had to reduce conducted noise at least as well as existing passive designs while reducing size and cost. A topology was implemented to attain the required electrical specifications in a significantly smaller, less expensive package.

To verify the filter's performance, the design team constructed a test setup for accurate conducted emissions measurement. The setup conforms to international testing standards on automotive emissions as specified by the IEC (International Electro-technical Commission). A block diagram of the test setup is shown in the figure. In order to measure the insertion loss, a LISN (Line Impedance Stabilization Network) is used. LISN is a filter network which is connected to the Spectrum Analyzer to measure the frequency response of the EMI filter.



B. Kang
Electrical Egr

D. Constan-Wahl
Electrical Egr

J. Zaheer
Electrical Egr



J. Weinberg
Electrical Egr



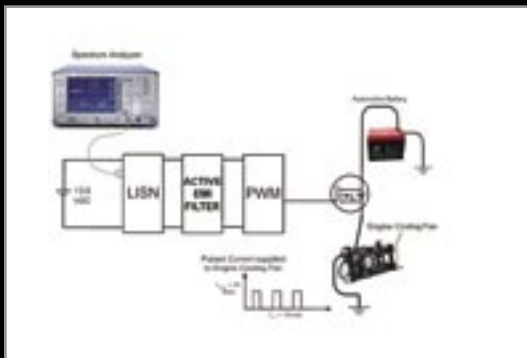
K. Zhang-Miske
Electrical Egr



BOSCH



Dr. McGough



Project Sponsor
Robert Bosch Corporation

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Byung-mo Kang
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EXTENDED STUDIES IN PIEZOELECTRIC TRANSDUCER CHARACTERIZATION

Our project, which was sponsored by *Lear Corporation*, was to conduct research and analysis on a piezoelectric sensor provided to us. The piezoelectric testing system developed at Michigan State University characterizes the electrical response of the piezoelectric material (piezo) with respect to varying impact forces.

Our primary objective was to find a relationship between the electrical energy output by the piezo sensor and the mechanical impact force applied to create the response. To complete this objective we focused on refining the testing process by performing an initial analysis of the piezo material provided to us and using this information to determine what parameters needed to be varied.

Our testing system needed to provide repeatable and accurate results in order to achieve valuable data from the captured electrical signal. The critical portion of the testing was to determine the power and energy of the piezoelectric response.

The benefits of characterizing this material can be applied in many automotive applications. A form of this technology is already being used in sporting equipment, such as tennis rackets and golf clubs.



D. Wyrembelski
Electrical Egr

J. McGinn
Electrical Egr

K. Quinn
Electrical Egr



P. Gresock
Electrical Egr

R. Quinlan
Electrical Egr



Project Sponsor
Lear Corporation

Sponsor Representatives
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Mr. John Nathan

Faculty Facilitator
Dr. Virginia Ayres

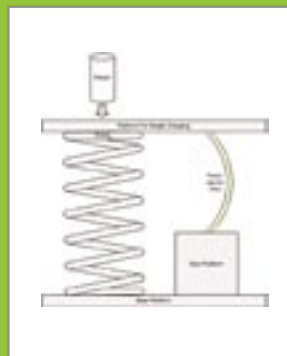
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Robert Quinlan
Manager

Kelly Quinn
Webmaster

Daniel Wyrembelski
Presentation Preparation



Dr. Ayres

TECHNICAL ASSESSMENT FOR REDUCING CO₂ EMISSIONS

Cummins & Barnard, Inc. is a well-established engineering consulting firm headquartered in Ann Arbor, MI. Founded in 1932, *Cummins & Barnard* provides consulting and design for thermal and electric generation, as well as distribution to institutional, industrial, commercial and utility clients. *Cummins & Barnard* prides itself on its core values including a commitment to professional ethics, a focus on what is currently significant, and to strive for improvement and progress in all projects.

Currently, *Cummins & Barnard* is heavily involved in the design and optimization of fossil fuel power plants which can yield massive amounts of power, but with a downfall of large amounts of CO₂ emissions that can lead to environmental problems. *C&B* is attempting to recommend alternative designs of fossil fuel plant systems to greatly reduce the CO₂ emissions in preparation of likely legislation to restrict such emissions.

The goal of this project was to provide *C&B* with an assessment of technology that can be utilized in the power industry to capture CO₂ post combustion. Two types of coal burning systems were analyzed: Integrated Gasification Combined Cycle (IGCC) and Pulverized Coal (PC). Because the technology related to CO₂ removal is still relatively unfamiliar to modern industry, the team provided *Cummins & Barnard, Inc.* with an overview of possibilities along with an assessment that included project constraint analysis. To solve the problem, constraints such as size, cost, and quality were examined to determine which technology would optimize the power plant output while minimizing the CO₂ emissions.

...*The Cummins & Barnard Student Design Team*



Steve Herrygers



Dr. Jaber

Cummins & Barnard is an engineering consulting firm located in Ann Arbor, Michigan. The majority of our work and experience is in the power industry. Many current clients and prospective clients are inquiring about gasification and whether or not the technology is fitting for their project. The work completed by MSU students this semester will assist *Cummins & Barnard* in providing information and recommendations to clients in the near future.

Steve Herrygers
Mechanical Engineer
Cummins & Barnard, Inc.

Project Sponsor
Cummins & Barnard, Inc.
Ann Arbor, Michigan

**Sponsor
Representatives**
Mr. Steve Herrygers
Mr. Christopher Zuelch

Faculty Advisor
Dr. Farhad Jaber

**Team Members and
Home Towns**
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Grosse Pointe Shores, Michigan

Alexis Bauer
Portland, Michigan

Mary Martin
Detroit, Michigan

Kristen Penk
Canton, Michigan

LOW-COST “IN-CAR” AUTOMOTIVE REFRIGERATOR

D*aimlerChrysler Corporation* is one of the largest automotive manufacturers in the United States. It was formed in 1998 through the merger of Daimler-Benz AG and Chrysler Corporation. The *Chrysler* group manufactures and sells cars in the United States under brand names such as Chrysler, Jeep, and Dodge.

DaimlerChrysler Corporation was interested in the development of a low-cost refrigerator that could be integrated into the interior of a vehicle and provide adequate cooling for snacks and beverages. The system was not to exceed cost targets and should minimize the impact to the overall vehicle packaging, weight, investment, and energy consumption when in operation.

The goal of the project was to develop, and provide to *DaimlerChrysler Corporation*, a baseline design concept and prototype that could be built upon by its Advanced Vehicle Engineering group in the development of a fully integrated low-cost automotive refrigerator feature for passenger vehicles, and would add to *DaimlerChrysler’s* existing portfolio of features for future products.

...*The DaimlerChrysler Corporation Student Design Team*



DAIMLERCHRYSLER

Team Members and Hometowns

Matthew Hartman
Mt. Pleasant, Michigan

Christoph Miller
Ludington, Michigan

Jared Sickles
Saginaw, Michigan

Ryan Spiekermann
Plainwell, Michigan

Project Sponsor

DaimlerChrysler Corporation
Auburn Hills, Michigan

Sponsor

Representative
Mr. George Konstantakopoulos

Faculty Advisor

Dr. Norbert Müller

The successful completion of this project will provide the *DaimlerChrysler Corporation* with a baseline design concept and prototype that can be built upon by its Advanced Vehicle Engineering group in the development of a fully integrated low cost automotive refrigerator feature for passenger vehicles, and will add to *DaimlerChrysler’s* existing portfolio of features for future products.

George Konstantakopoulos
Supervisor
DaimlerChrysler Corporation



George Konstantakopoulos



Dr. Müller

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Achieving more together



LAKE HURON ROOM SCHEDULE: ECE480 SENIOR CAPSTONE DESIGN PROJECTS AND ME481 MECHANICAL ENGINEERING DESIGN PROJECTS

PRESENTATION SCHEDULE – Lake Huron Room

Course Coordinators: Dr. Erik Goodman, Mr. Timothy Hinds
and Dr. Craig Somerton

Faculty Facilitators: Professors Brereton, Gokcek, Guven,
Oweiss, Salem, Semig, Strangas, Xi

Time & Location	Project Sponsor	Sponsor Contact(s)	Faculty Facilitator	Team and Project Title
8:00 Lake Huron ECE480	Press-Sure, LLC	D. Norton B Overholt C. Underwood G. Walker	E. Strangas	Team 11: Second generation Equa-Lizer prototype
8:25 LakeHuron ECE480	Michigan Renewable Energy Program	J. Gear T. Stanton S. Wallace	P. Semig	Team 10: Energy-saving Thermostat with Energy Usage Tracking System
8:50 LakeHuron ECE480	DaimlerChrysler; RCPD	S. Blosser	K. Oweiss	Team 6: Adjustable force-sensing switch to assist users with disabilities
9:15 Lake Huron ECE480	DaimlerChrysler; MSU Artificial Language Laboratory; Rotary International	S. Blosser	F. Salem	Team 5: Beep baseball: Finding the best beep
10:00 Lake Huron ECE480	Whirlpool Corporation	K. Chase R. Jeffery M. Nibbelink	F. Salem	Team 7: Ice Imaging for Control of Automatic Icemakers
10:25 Lake Huron ECE480	Whirlpool Corporation	K. Chase	N. Xi	Team 8: Container Size Sensing for Appliances
10:50 Lake Huron ECE480	MSU Intercollegiate Athletics	R. Church	C. Gokcek	Team 14: M1A3 Sparty Tank
11:40 Lake Huron ME481	Behr	J. Dziejczak A. Kleinow	G. Brereton	Behr HVAC noise reduction
12:05 Lake Huron ME481	Borg Warner Thermal Systems	D. Buckley D. Pickelman	O. Guven	Improving performance of a heavy duty engine cooling clutch through reduction of drag losses

SECOND-GENERATION EQUA-LIZER PROTOTYPE

Team 11 was tasked with designing a second-generation prototype for the Equa-Lizer. The Equa-Lizer is a device that inflates or deflates a ball to a precise, preset air pressure and then extracts the needle once the ball reaches the desired pressure. The sponsor for this project, *Press-Sure LLC*, wanted the Equa-Lizer to be manufactured and marketed to sports teams and camps.

The first prototype will inflate or deflate a ball to within 0.1 psi of a specified pressure in less than 30 seconds before retracting the needle automatically. The sponsor specified that they wanted a second-generation prototype to perform this same task but have reduced cost, weight and size, while having increased reliability and manufacturability.

Team 11 built a second generation prototype that has a more user-friendly interface, is more durable, is manufacturable, and has reduced cost, weight and size. This second-generation prototype allows the user to select the pressure to within 0.1 psi and is accurate to 0.01 psi. Integration of a PSoC microcontroller and other new electrical components allowed a great reduction in the hardware count used in this new prototype.

The mechanical engineering students were able to redesign the pneumatic system and chose a new compressor to reduce weight and size. This new second-generation prototype could one day be used by sports teams and camps everywhere, improving game play.

<http://www.egr.msu.edu/classes/ece480/goodman/spring/group11/>



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ENERGY-SAVING THERMOSTAT WITH ENERGY USAGE TRACKING SYSTEM

Heating, ventilation and air conditioning (HVAC) consumes the largest amount of energy in the American home. Consequently, less use of HVAC equipment results in lower energy bills for the homeowner. Through the Michigan Public Service Commission (MPSC) and the Michigan Renewable Energy Program (MREP), a project was proposed to increase the efficiency of HVAC device usage.

The project consists of a redesigned thermostat and a universal wall-mount interface system used to control residential comfort levels. Our product allows the user to select an automatic “economy” setting that maintains comfort while saving energy. It also can calculate the approximate cost of running home HVAC equipment. With an informative display that encourages energy-saving comfort settings, the system also shows energy cost and usage trends using data from the previous 60 days. The thermostat easily connects to and disconnects from the wall plate, similarly to a telephone. This allows for an easy switch to upgraded thermostats in the future.

This project incorporates the 55-2004 standard from the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE). Normal thermostats use only temperature, while our ASHRAE-based system uses indoor temperature, outdoor temperature, and relative humidity to gauge physical comfort level. The end result is less energy use with virtually no reduction in personal comfort.

We have designed a new thermostat system that could significantly lower energy consumption nationwide. Reducing residential HVAC equipment usage by only 1% would result in an annual national savings of over \$800 million. Our system will save money, lessen the strain on the energy distribution infrastructure, and reduce dependence on foreign oil.

Web page: <http://www.egr.msu.edu/classes/ece480/goodman/spring/group10/>



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M. Palmer
Electrical Egr



S. Paladino
Electrical Egr



Thank you to the following companies for their support:

AND Displays by Purdy Electronics, Inc.

Sensirion Inc.

Cypress Semiconductor

Project Sponsors
Michigan Public Services
Commission, Michigan
Renewable Energy Program

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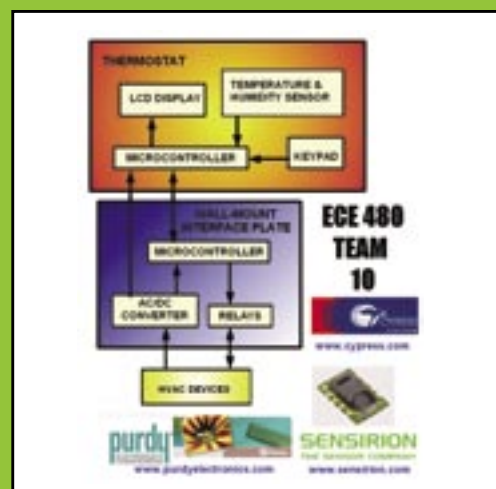
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Anthony Fields
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Mr. Semig

ADJUSTABLE FORCE-SENSING SWITCH TO ASSIST USERS WITH DISABILITIES

Team 6 has designed a device using two force sensors which will function as switches. These switches will be used by wheelchair users to control peripheral devices, such as a communication or movement aid. The switch accepts a small force and rejects noise and accidental inputs. Users can calibrate the sensors according to their personal strength levels to determine what constitutes an intentional press. Therefore, even users with very low strength can use the device.

The threshold voltage level is saved to a microcontroller's memory, but can easily be recalibrated to suit the changing needs of any individual. The microcontroller interprets the voltages read from the switch and compares them to the threshold level. If the voltage exceeds the threshold, a relay is closed which then activates the connected peripheral. For demonstration purposes, a buzzer is activated when a button is pressed. The user can choose for the buzzer to sound continuously, beep briefly, or be completely muted. An LED, corresponding to which sensor was pressed, is also lit.

The device is powered by two 1.5 volt rechargeable batteries. The LEDs are also used to indicate whether the batteries are charged or low. This device will serve to make life easier for many individuals with disabilities. Mr. Stephen Blosser of the *MSU Resource Center for Persons with Disabilities and Artificial Language Laboratory* has provided guidance and inspiration for this project.
 Webpage: <http://www.egr.msu.edu/classes/ece480/goodman/spring/group06/>



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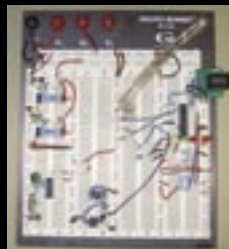
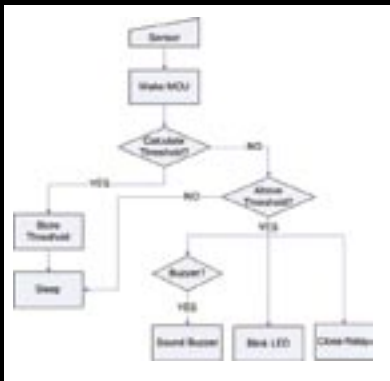


Resource Center for
Persons with Disabilities

DAIMLERCHRYSLER



Dr. Oweiss



Project Sponsors
MSU Resource Center for
Persons with Disabilities
and DaimlerChrysler

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BEEP BASEBALL: FINDING THE BEST BEEP

The popular sport of baseball has been adapted to grant the same joy of America’s pastime to the blind and visually impaired, through a sport called “beep baseball.” Team 5 designed a field programmable baseball to allow the testing of various sound patterns with a single ball. Determining the best sound pattern required the help of volunteers, NBA players and blindfolded Team 5 members, to actually play beep baseball and record useful comments and data.

By determining a more desirable pitch and frequency, players were able to locate the ball faster, increasing both the safety of the players and the performance of the game. As for ball construction, Team 5 redesigned the internal circuitry, optimized the size of the electronics and improved functionality. The circuit is powered by a 9V battery which powers a DC-to-DC converter to create an input voltage of approximately 30V for the piezoelectric buzzers. A surface mount design was chosen to increase the durability of the circuit and also decrease the size of the board. Furthermore, creation of a graphical user interface made selection and download of sound patterns to the ball simple and efficient. The final goal was the creation of two beep baseballs: one with the optimal sound pattern ready for use, and the other, a programmable ball allowing players to select from different sound patterns.

To learn more about the project and Team 5, please visit our website: <http://www.egr.msu.edu/classes/ece480/goodman/spring/group05/index.html>



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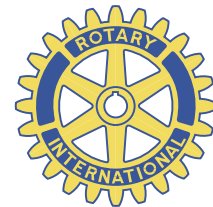
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DAIMLERCHRYSLER



Project Sponsors
MSU Artificial Language Laboratory, Resource Center for Persons with Disabilities, Daimler-Chrysler, Rotary International

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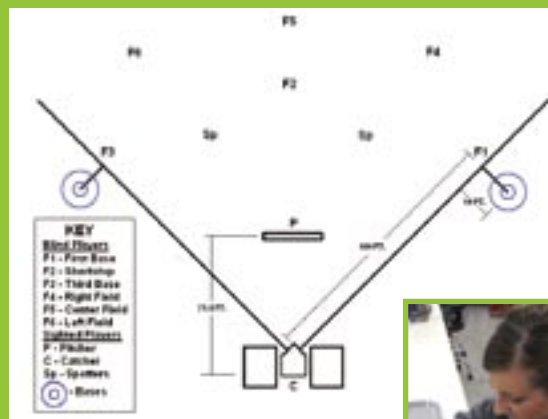
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Dr. Salem



ICE IMAGING FOR CONTROL OF AUTOMATIC ICE MAKERS

Team 7 was sponsored by *Whirlpool Corporation* to find a new and innovative way to detect the ice level in a freezer's ice bin. Current level-sensing implementations require custom technology for each ice maker, which makes it more difficult to adapt to changes in the ice maker's shape, size, or design. Therefore, a requirement for this project was that it be universal so it can be implemented across *Whirlpool's* line of ice maker configurations with minimal changes.

Whirlpool decided that using camera imaging technology is the way they wanted to meet that goal, because of its flexibility in both shape and size, and the potential that it offers in the detection of other properties such as ice quality. In addition, our solution allows for the capability of choosing the desired height in the ice bucket instead of detection at only a discrete level, allowing the customer to choose how much ice is to be produced.

The resulting technology is inexpensive, portable, and expandable, and will benefit both *Whirlpool* and the customer by providing enhanced functionality and new features at minimal cost.

<http://www.egr.msu.edu/classes/ece480/goodman/spring/group07/>



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Computer Egr



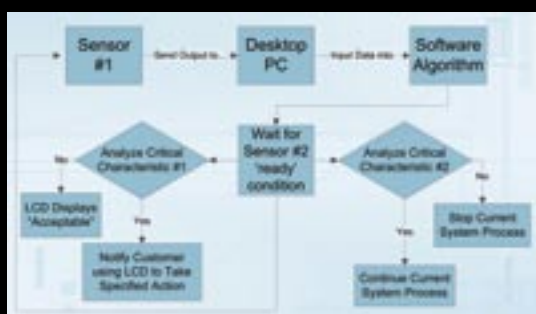
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S. Phouapanya
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Dr. Salem



Project Sponsor
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CONTAINER SIZE SENSING FOR APPLIANCES

Whirlpool Corporation has sponsored this project to develop an inexpensive yet effective way to sense the height of a container inside a refrigerator/freezer. However, Whirlpool did not specify how this technology would be incorporated in their product line, or what type of system they preferred. Thus, extensive research and prototyping was necessary to determine which available technology performed the best for our particular application.

After researching many types of sensors, our team conferred with Whirlpool to decide on three types of sensing systems. Our team explored the characteristics of a viable solution to the problem and specified three designs to fit the general Whirlpool product line. Through extensive testing of our three prototypes, we determined which of the sensing solutions performed the best using a set of criteria determined in conjunction with Whirlpool.

At the conclusion of our project, we have all three sensing solutions performing correctly with a high level of accuracy and consistency. Whirlpool will eventually determine which solution they want to work with for the final prototype, which is expected to be implemented in the near future.



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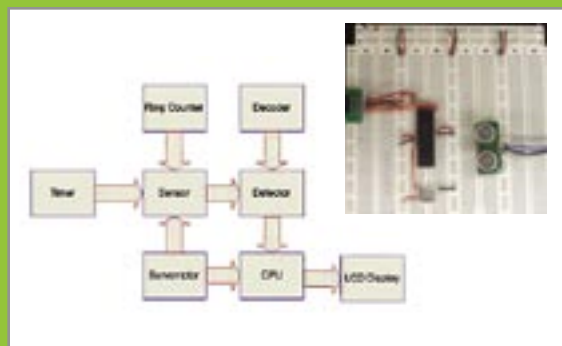
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Dr. Xi

M1A3 SPARTY TANK

Two years ago, *Michigan State University Intercollegiate Athletics*, along with *Sports Broadcasting*, wanted to create a robotic Sparty that would be able to interact with fans at MSU sporting events. The task was taken up by four electrical engineers as their Capstone Design project. The student team built a robotic Sparty to participate in the pre-game and halftime shows at MSU basketball games. While the robot was functional, its aesthetics and reliability left a lot to be desired. In the end, the robotic Sparty never made a halftime appearance to inspire the crowd.

This year a team of dedicated Spartans, comprised of four electrical and four mechanical engineers, revisited the project with the goal of providing an aesthetically pleasing, workable robot Sparty. The team chose to place Sparty at the helm of a remote controlled tank. His treads are capable of traversing a multitude of terrains including ice, grass and even hardwood floors. He has a built-in launcher at his disposal, which is capable of shooting t-shirts or balls into the top of the Breslin upper deck. Motors inside Sparty give him life-like arm flexing ability to inspire fans to cheer and support the team. The M1A3 SPARTY tank will be the envy of rival Big Ten schools, and his stage presence and dynamic capabilities will delight Spartans for years to come.

<http://www.egr.msu.edu/classes/ece480/goodman/spring/group14/>



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BEHR HVAC NOISE REDUCTION

The Behr Corporation is a world recognized systems partner for the international automobile industry. Behr is an original equipment manufacturer specializing in air conditioning and engine cooling systems. Behr has 31 development and production sites around the globe in Europe, North and South America, Asia, and South Africa.

Behr is interested in eliminating the last acoustic signature left in their innovative HVAC design. Consumers have complained that they hear a brief whistling noise when changing the dual climate control. During the rotation of an HVAC over-molded door from its sealed to open position, this noise was generated from air accelerating over the door-seal unit. The goal was to create a door, seal, and/or housing design that would eliminate any acoustic signal noticeable to automobile passengers.

An optimal design was achieved after extensive prototyping and testing. By implementing a whistle reducing design as a standard seal design for all over-molded seals, a persistent quality concern associated with this sealing technology was eliminated and HVAC module development costs were reduced. Future reductions in associated warranty costs will also lower costs further.

...The Behr America Student Design Team



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HVAC module doors equipped with integral over-molded rubber seals are often plagued by high-pitched whistle noises when the door transitions from an open to a closed, or sealed, position. Despite this concern, the use of rubber over-molded seals is very common throughout the industry due to certain cost advantages provided by these doors compared to other door sealing technologies. By implementing the whistle reducing design as a standard seal design for all over-molded seals, a persistent quality concern associated with this sealing technology would be eliminated and HVAC module development costs would be reduced. Reductions in associated warranty costs would likely reduce costs even further.

Aaron Kleinow
Team Leader - HVAC Function
for DaimlerChrysler Programs
Behr America Inc.



Aaron Kleinow



Dr. Brereton

IMPROVING PERFORMANCE OF A HEAVY DUTY ENGINE COOLING CLUTCH THROUGH REDUCTION OF DRAG LOSSES

BorgWarner Thermal Systems is the leading designer and supplier of engine thermal management components for global vehicle manufacturers and aftermarket applications. The Marshall location of BorgWarner Thermal Systems was formerly known as Eaton Fluid Power until it was acquired by BorgWarner along with the two other industry leaders, Kysor and Schwitzer, in 1999. BorgWarner Thermal Systems has eleven locations in seven countries, with approximately 1300 employees. The group serves the light vehicle, medium & heavy duty truck, and off-highway vehicle markets.

BorgWarner Thermal Systems had recently brought a new heavy duty engine cooling fan and clutch assembly to market. This product's performance was anticipated to be more efficient if the drag on the static pump in the fluid flow path within the rotating clutch could be reduced. The increased efficiency is a benefit that a customer can appreciate when outfitting their vehicle engine cooling system.

...The BorgWarner Student Design Team



Don Buckley

BorgWarner Product Engineering Department designs engine-driven engine cooling module components including a new heavy-duty fan drive assembly and a molded nylon fan that gets fastened to it. Designs like this typically dissipate heat that is generated by viscous fluid shear within the aluminum die cast fan drive housing. The company is anticipating product improvement that will help expand the sale of this new engine cooling offering in the commercial trucking industry.

Don Buckley
Senior Product Engineer
BorgWarner Thermal Systems



Dr. Guven

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LAKE ERIE ROOM SCHEDULE: ME481 MECHANICAL ENGINEERING DESIGN PROJECTS

PRESENTATION SCHEDULE – LAKE ERIE ROOM

Course Coordinators: Mr. Timothy Hinds and Dr. Craig Somerton

Faculty Advisors: Professors Baek, Foss, Loebbestael, Loos, Mukherjee, Patterson, Regan and Thompson

Time	Project Sponsor	Sponsor Contact(s)	Faculty Advisor(s)	Project Title
8:00 Lake Erie ME 481	DaimlerChrysler	G. Konstantakopoulos	J. Foss	Variable position door stop
8:25 Lake Erie ME 481	Stryker	C. Siler	S. Baek	Braking system for a hospital bed
8:50 Lake Erie ME 481	Michigan State University	R. Baliff	A. Loos	Redesign of a multiple wheelchair transport device
9:15 Lake Erie ME 481	Precision Prototype	J. Beeler	R. Mukherjee	Precision prototype building addition
10:00 Lake Erie ME 481	Dow Chemical Company	C. Reid	D. Regan B. Thompson	Dow Chemical hermetic seal model
10:50 Lake Erie ME 481	AirmasterFan Company	B. LaZebnik	M. Loebbestael D. Regan B. Thompson	Whole house fan with latent heat recovery
11:40 Lake Erie ME 481	Airmaster Fan Company	B. LaZebnik	E. Patterson	No-moving-parts fan

VARIABLE POSITION DOOR STOP

DaimlerChrysler is a multinational automobile manufacturer that has been operating in various configurations since 1925. DaimlerChrysler's history as an innovative design and engineering center is well established and the terrific results of the company's ingenuity impact consumers worldwide.

The motions required to open and close a passenger vehicle door are second nature to most people. Most current production vehicles have only a partially and fully open position. The goal of this project was to develop a device that will hold a vehicle door in any user defined position between fully closed and fully open, to increase user convenience.

Four main issues were taken into account to solve the problem. The user experience was foremost: the device has to operate in a manner and require input similar to current production doors. The forces that the door check device must counteract through its range of operation had to be determined. Safety considerations require that no unintended actions occur when used to avoid injury. Minimal modification to the existing frame and door was a consideration because it reduces the time required to introduce the product to the market. After conducting research and developing numerous conceptual solutions, the best design was identified and prototyped, operating successfully.

...The DaimlerChrysler Student Design Team



DAIMLERCHRYSLER



George Konstantakopoulos

The successful completion of this project will provide the DaimlerChrysler Corporation with a baseline design concept and prototype that can be built upon by its Advanced Vehicle Engineering group in the development of a fully integrated variable position door stop feature for passenger vehicles, and will add to DaimlerChrysler's existing portfolio of features for future products.

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Supervisor
DaimlerChrysler Corporation



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BRAKING SYSTEM FOR A HOSPITAL BED

Stryker Corporation has been at the forefront of producing quality medical products and services around the world since being founded in 1941. Stryker Corporation's products include patient handling equipment, surgical implants, surgical instruments, micro power tools, and emergency medical services (EMS) equipment. In 2005 annual sales for Stryker Corporation reached an all time high of \$4.9 billion and forecasts for the company predict increasing sales.

Stryker Corporation currently produces the "Cadillac" of hospital beds known as the Secure II Med/Surg. Bed. This bed features a dual pedal brake design, backrest angle indicator, and even features a retractable frame that allows patients to keep personal items close and accessible. Stryker's med/surg hospital beds provide the highest level of security, intuitive operation and flexible functionality through a host of various features for both the patients and the caregivers. One of these important features is a braking system. The braking system, when activated, prevents the bed from moving across the floor.

The goal of this project was to create several innovative braking system designs that could be implemented into Stryker's future med/surg beds. Design concepts required potential to meet international standards as well as meet the dimensional constraints of current bed frames. Concepts created ranged from simple four-bar linkages to complex systems involving hydraulics.

Ideas for designs were created during brainstorming sessions and by researching pre-existing equipment.

...The Stryker Corporation Student Design Team



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Conceptual designs of brake systems will provide Stryker with some out-of-the-box ideas that could change how hospital beds are locked in place. These designs could increase Stryker's competitive advantage by potentially increasing performance, decreasing cost, and becoming easier to manufacture and service. The patient and caregiver's safety and security is always most important, and new brake system designs will continue to build on Stryker's current reputation for quality products.

Chris Siler
Design Engineer
Stryker Medical



Chris Siler



Dr. Baik

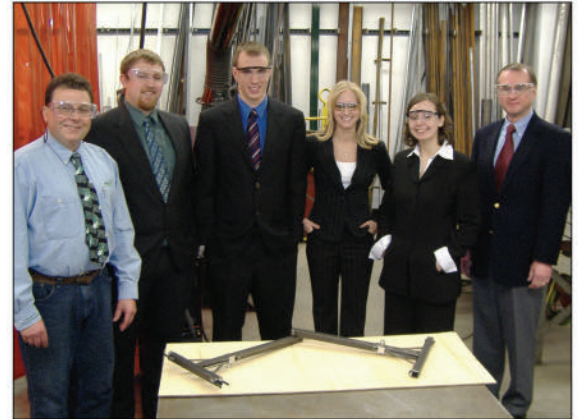
REDESIGN OF A MULTIPLE WHEELCHAIR TRANSPORT DEVICE

Founded in 1855 as a land-grant college, *Michigan State University* has been advancing knowledge and transforming lives through innovative teaching, research, and outreach for over 150 years. Through the Design Day program, *MSU* has reached out to improve the lives of those in the community. The “Mr. T” Wheelchair Connector Student Design Team was given the task of redesigning an existing multiple wheelchair transport device. Several local schools have been using the original devices over the past year for special needs children. While the devices are functional, there is a need for design and performance optimization.

The device was redesigned utilizing Design for Manufacturing principles in an effort to reduce manufacturing time, increase safety, and drive down production costs. The needs of the consumer were evaluated through on-site interaction with special needs caretakers, who emphasized the need for a more adaptable product to meet the widely varying demands caused by several different types of wheelchair. Lighter, more durable, and less expensive materials and designs were considered to improve product quality.

The revised “Mr. T” will have a substantial impact on the wheelchair community. Allowing one attendant to safely transport two individuals helps bridge the widening gap between demand and availability of caretakers. No product currently available on the market addresses this demand, thus creating a valuable opportunity for *MSU*. The new design is significantly easier to manufacture, safer, and more versatile than the previous design, allowing for more communities to enjoy the benefits of the product.

...*The MSU Mechanical Engineering Student Design Team*



MICHIGAN STATE
UNIVERSITY



Roy Bailiff

This project will enhance the educational day for many students with developmental disabilities. It will allow for increased stimulation, socialization and leisure/recreation and educational opportunities for each individual student. It will also increase the safety of students as this device will allow staff to get students from one place to another in a timelier, efficient manner.

Roy Bailiff
Michigan State University



Dr. Loos

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PRECISION PROTOTYPE BUILDING ADDITION

Precision Prototype utilizes more than fifty years of combined metal working design and production experience to provide high quality prototype and production parts. They have the ability to work with materials such as steel, acrylic plastic and non-ferrous metals and can turn many parts around in as little as 24 hours. Precision Prototype has doubled in size over the past two years and is looking to expand their building to allow for further growth.

The company currently utilizes the latest in technology, with 4000 watt CO₂ laser cutters and several CNC benders, machining centers and lathes. These CNC machines allow for greater flexibility and repeatability, providing them the ability to supply high quality prototypes, even at production level quantities.

The goal of this project was to design a building addition for Precision Prototype to allow for further expansion, while producing multiple layouts of floor plans to minimize their production time and increase production efficiency. The main problems that needed to be addressed were the method of unloading metal shipments from trucks, crane design, and the layout of the interior of the new building.

These problems were addressed by identifying five main areas: the crane system, the method of unloading supply trucks, production processes, and safety and city ordinances. After research was completed, an optimal design was created.

...The Precision Prototype Student Design Team



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Joy Reichenbach,
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This project will help our company improve the efficiency in which we ship and receive product, freeing up employees for value-added work. Second the project will provide us with room in which to expand our production capabilities. Finally, the project will allow us to become more organized allowing us to focus on quality, quality standards and customer satisfaction.

Jason Beeler
Operations Manager
Precision Prototype & Manufacturing, Inc.



Jason Beeler



Dr. Mukherjee

DOW CHEMICAL HERMETIC SEAL MODEL

The Dow Chemical Company is a leader in science and technology, providing innovative chemical, plastic and agricultural products and services to many essential consumer markets. Dow demonstrates their commitment to society by providing products that improve the quality of daily human life. Dow plays an integral part in food packaging, as the largest global supplier of plastics to this market segment. Dow supplies resin to their customers who, in turn, will create film from the resin. The film is then sealed to create a package which is filled with product. Hermetic seals are a necessity for many packages as they extend the shelf life and protect the integrity of the product.

The goal of this project is to create a mathematical model to determine the time, temperature, and pressure required to effectively create a hermetic seal, with Dow's resins, using heat transfer and polymer diffusion. Once the model is created, its results must be tested. A prototype will be developed to create a hermetic seal using only the output data of time, temperature, and pressure.

The second phase of this project utilizes the prototype by developing a business-to-business marketing campaign. The main objective of the campaign is to motivate customers to select film made from Dow's plastics over their competitors, and to communicate Dow's motive to sell and not simply inform. Qualitative research will be conducted to ascertain the needs and wants of prospective and current customers to find out more ways for Dow to continue providing its customers with the highest quality products.

...The Dow Chemical Student Design Team



Dr. Regan

The development of a mathematical model predicting the seal conditions needed to make hermetic seals will allow for improved use and marketing positioning of Dow sealant resins. In order to provide maximum food protection and safety, packages must be sealed with hermetic seals. The conditions needed for hermetic seals are critical requirements for food manufacturers.

Christina Reid
Research Engineer
Dow Chemical Company



Christina Reid

Team Members and Home Towns

Seth Grua
East Lansing, Michigan

Megan Lawrence
Burton, Michigan

Dana LeMire
Escanaba, Michigan

Matt Rokosz
Bay City, Michigan

Katie Slovan
Novi, Michigan

Anita Solitro
Sterling Heights, Michigan

Stephanie Wong
Troy, Michigan

Project Sponsor
Dow Chemical Company
Freeport, Texas

Sponsor Representative
Ms. Christina Reid

Faculty Advisors
Dr. Dave Regan
Dr. Brian Thompson



Dr. Thompson

WHOLE HOUSE FAN WITH LATENT HEAT RECOVERY

Airmaster Fan Company is a commercial and industrial fan manufacturer whose roots can be traced back to Phillip Diehl and the first patented practical electric fan in 1886. The company is located in Jackson, Michigan. Their facility is complete with a sales and marketing department, an engineering staff, a fan testing laboratory accredited by AMCA (Air Movement and Control Association), metal fabricating machinery, and tool and die facilities.

Airmaster Fan Company requested that our multi-college team (comprised of engineering, marketing, and advertising students) develop a new product that will recover heat from a warm attic on a cool day and return that heat to the living space of the house. The system will supplement the heating system and reduce energy usage within the home. With the rising energy prices and industry focus on efficient, cheap, and more environmentally friendly products, this new fan may become the industry standard.

The main objective of the engineering team was to design a control system for the fan. To accomplish this goal, a heat transfer and fluid analysis was performed to determine flow patterns, optimal operating conditions, and potential cost savings associated with the recovered heat. After a careful analysis, the optimal controller components were chosen and a functional control system prototype was built. This prototype will provide the user with a variety of functional options and be fully functional when delivered. The marketing and advertising students were to evaluate the company's strengths, weaknesses, opportunities, and competition in regards to this new product. Overall, we wanted to revamp the sales materials of Airmaster Fan Company to bring a fresh brand image to the company. We felt with a stronger brand image, Airmaster Fan Company would be able to market itself and its products more effectively and efficiently, which in turn would increase its sales revenue.

... The Airmaster Fan Company Multi-College Design Team



Project Sponsor
Airmaster Fan Company
 Jackson, Michigan

Sponsor Representative
 Mr. Bob LaZebnik

Faculty Advisors
 Dr. Michael Lobbestael
 Dr. Dave Regan
 Dr. Brian Thompson

Team Members and Home Towns
 Andrew Gillett
 Troy, Michigan

Chad Kleinow
 Carleton, Michigan

Chrystal Kozsey
 Medina, Ohio

Andrew Kruk
 Livonia, Michigan

Kevin McKay
 Milford, Michigan

Airmaster will benefit from development of this new product through market penetration of a whole house fan unique in the industry because of the latent heat recovery system. This will lead to increased sales and growth. The project employs students in product improvement designing electronic controls, specifications, sizing, testing and design performance and marketing applications, such as writing clear installation instructions, news releases, strategies for introduction of new product, etc.

Bob LaZebnik
 Owner
 Airmaster Fan Company



Dr. Regan



Bob LaZebnik



Dr. Lobbestael



Dr. Thompson

NO-MOVING-PARTS FAN

Airmaster Fan Company sponsored the project of a fan with no moving parts. Airmaster traces its roots to Phillip Diehl who patented the first practical electric fan in 1886. Airmaster's production consists of a variety of fans, from air circulators to large industrial and commercial exhaust fans. Airmaster has on-site metal fabricating machinery, an experienced marketing and sales staff, an Air Movement and Control Association (AMCA) accredited laboratory, and a staff of engineers. The no moving parts fan fits nicely into Airmaster's production line; it stays within their current market and will draw a larger market due to its ability to be used in Class I, Groups A, B, and C hazardous locations. Electric motors are not available for these atmospheres.

The goal of this project was to continue to develop an optimized no-moving-parts fan. The fan was to be developed with respect to the airflow, cost, manufacturing process, efficiency and noise radiation. In addition to providing Airmaster with a final product, a viable marketing vehicle was designed to fit the product and the company's objectives.

To solve the problem, five essential design parameters were identified: function/performance, cost, safety, reliability and quality. Each parameter was intensely researched for an optimal solution. The culmination of this research led to the optimal design, and thus the final product.

...The Airmaster Fan Company Student Design Team



Bob LaZebnik



Dr. Patterson

The development of this new product will help Airmaster's growth and market penetration. In addition, the project enables students from a variety of disciplines to participate in all aspects of manufacturing and marketing including testing and design performance, sizing, design of electric controls, applications, energy savings, evaluation of product, writing of installation instructions and news releases, and market strategies, etc.

Bob LaZebnik
Owner
Airmaster Fan Company

Team Members and Home Towns

Anthony Beal
Farmington Hills, Michigan

Mike Lambert
Houghton Lake, Michigan

Dilip Thomas
Dubai, United Arab Emirates

L. Marie Verrier
Macomb, Michigan

Steven Yang
Grand Rapids, Michigan

Project Sponsor
Airmaster Fan Company
Jackson, MI

Sponsor Representative
Mr. Bob LaZebnik

Faculty Advisor
Dr. Eann Patterson



REMEMBER WHEN YOUR CAREER CHOSE YOU?

FINDING SOMETHING YOU'RE PASSIONATE ABOUT doesn't happen every day, so when you do find it, you embrace it. At Boeing, we believe passion is what fuels our innovations and inspires our employees to be more than they ever thought possible. As we continue on our journey to amazing destinations, we want you to help take us there. You'll be joining an organization known for its support of learning both on and off the job, and one that has also been honored as higher education's top corporate sponsor. The job categories below include some of the key skills we are seeking.

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- Business/Finance
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- Electromagnetic Engineering
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- Industrial Engineering
- Manufacturing Engineering
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- Optics
- Payloads
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- Propulsion
- Reliability Maintainability Testability Engineering
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Tower

8:00 – 12:30
Fourth Floor
Tower Room

MECHANICAL ENGINEERING DESIGN PROJECTS

PRESENTATION SCHEDULE – Tower Room

Course Coordinators: Mr. Timothy Hinds and Dr. Craig Somerton

Faculty Advisors: Professors Haddow, Hinds, Koochesfahani, Pence, Pourboghrat, Restivo, Somerton, Wichman and Zhuang

Time	Sponsor(s)	Project Contact(s)	Faculty Advisor	Project Title
8:00 Tower Room ME 481	Louis Padnos Iron & Metal Company	B. Herweyer M. Przekadzinski	I. Wichman	Design of a cleaning system for shredded plastic
8:25 Tower Room ME 481	Solar Circle	J. Martin	C. Somerton	Solar ovens in Tanzania
8:50 Tower Room ME 481	General Motors Corporation	J. Masini M. Ply	T. Pence	Best development of a seal test fixture
9:15 Tower Room ME 481	Shell Oil Company Henry H. North Middle School	G. Garmyn V. Pratt	A. Haddow	Shell Oil Company children's humanitarian project: Desk chair to accommodate special needs children
10:00 Tower Room ME 481	JMT Farms	N. Montei	M. Zhuang	Van's Aircraft Venture
10:25 Tower Room ME 481	New Horizons Music	R. Moe	T. Hinds	Assistive accuation of brass instrument valves
10:50 Tower Room ME 481	General Motors Corporation	J. Masini M. Ply	M. Koochesfahani	Best in class glass run channel
11:15 Tower Room ME 481	Heartwood School	M. O'Brien	G. Restivo	Adaptive shower chair
11:40 Tower Room ME 481	General Motors Corporation	J. Karlavage M. Ply	F. Pourboghrat	Coupe door system – hold open device optimization
12:05 Tower Room ME 481	MACSTEEL	G. Longo	D. Ki	MACSTEEL best practice calculator

DESIGN OF A CLEANING SYSTEM FOR SHREDDED PLASTIC

Louis Padnos Iron & Metal Co. originated from an immigrant named Louis Padnos in 1905 in Holland, Michigan. Originally, Padnos was a small business concerned with simple scrap sales. Today the company has grown to become a major influence in the recycling industry and now has fourteen locations throughout Michigan, which recycle metal, paper and plastics. Louis Padnos Iron & Metal Co. has a tradition of geographic and market expansion, which continues to this day with the development of new recyclables and processes.

Padnos has recently begun an investigation into the process of cleaning plastic garbage and fruit containers for recycling. These containers are typically covered with contaminants, including dirt, adhesives, and pop and fruit syrup. In order for these items to be successfully recycled, these contaminants must be removed.

The goal of this project was to design an automated washing and drying process for recycling HDPE plastic. The known parameters included the incoming shredded plastic dimensions, most likely contaminants in the plastic, and a desired processing rate.

To solve the problem, all existing methods for washing and drying recycled HDPE plastic were researched and analyzed. The optimal process was then selected and designed to fit the required design parameters.

... The Louis Padnos Iron & Metal Company Student Design Team



Project Sponsor
Louis Padnos Iron & Metal Company
 Holland, Michigan

Sponsor Representative
 Mr. Bob Herweyer
 Mr. Martin Przekadzinski

Faculty Advisor
 Dr. Indrek Wichman

Team Members and Home Towns
 Seunghee Han
 Anyang, Republic of South Korea

Richard Pospiech III
 Northville, Michigan

Matthew Siero
 Plymouth, Michigan

William Smits
 Howard City, Michigan

Successful cleaning of shredded contaminated plastics will allow Padnos to find new markets while helping the environment by keeping this material from the landfills.

Bob Herweyer
 IXL Machine Shop Supervisor
 Louis Padnos Iron & Metal Company



Bob Herweyer



Dr. Wichman

SOLAR OVENS IN TANZANIA

Solar Circle is a Michigan non-profit organization developed to provide affordable solar-powered ovens to the people of Masasi, Tanzania. It is an aspiration of the association to utilize materials primarily from Tanzania in order to avoid the high costs associated with importing.

Currently, wood and wood charcoal are used for cooking in Tanzania. This method is highly undesirable for two reasons: it contributes to high rates of deforestation and causes respiratory diseases as a result of the smoke inhalation. The cost of a current oven is \$70, approximately 15% of the annual income in the area.

The goal of the *Solar Circle Student Design Team* was to design an oven taking into account the following design considerations: adjustability, domestic material availability, efficiency, manufacturing ease and cost, safety, transportability, weight. It was an additional objective of the team to produce an oven that is aesthetically pleasing to the people of Tanzania.

... *The Solar Circle Student Design Team*



Judy Martin

The project will examine the design, materials and production of solar ovens in Tanzania. Project results will be used to improve the ovens, enabling Tanzanian artisans to produce inexpensive light-weight, efficient solar ovens. This will have a major impact on reducing the incidence of upper respiratory disease and deforestation caused by the use of wood fuel for cooking.

Judy Martin
President
Solar Circle



Dr. Somerton

Team Members and Home Towns

Allison Lewis
Fenton, Michigan

Stacie Proctor
Grand Rapids, Michigan

Gerard Westover
Monroe, Michigan

Matt Winkley
Port Sanilac, Michigan

Project Sponsor

Solar Circle
Okemos, Michigan

Sponsor Representative

Ms. Judy Martin

Faculty Advisor

Dr. Craig Somerton

BEST DEVELOPMENT OF A SEAL TEST FIXTURE

General Motors Corporation is the largest American automobile manufacturer. It is part of the “Big Three” automotive companies with many affiliates. These affiliates include Buick, Cadillac, Chevrolet, GMC, Saab, Pontiac, HUMMER, Oldsmobile, and Saturn. The world headquarters was recently relocated to the Renaissance Center in downtown Detroit, Michigan. The technical center is located in Warren, Michigan, where the majority of innovations are developed.

The glass run channels used around the windows of automobiles play a large role in the passenger’s comfort. A good glass run channel is able to reduce noise and hold a stable pressure inside the car at all times. Because of this importance, GM is looking for a fixture design that will test the abilities of different glass run channels consisting of different sizes and shapes.

The goal of this design was to design a robust glass run channel test fixture for *General Motors Corp.* that would accurately measure the pressure and noise differential across a glass sample while providing repeatable results. Additionally, the fixture should adjust to multiple glass run channel designs and utilize lateral glass movement to create different seal-glass interactions.

Four critical components were identified: the geometry of the pressure chamber, adapting to different run-channel designs, creating lateral displacement and sealing the test segment. The optimal design was then identified.

...*The General Motors Seal Test Fixture Design Team*



Project Sponsor
General Motors Corporation
 Warren, Michigan

Sponsor Representatives
 Mr. Jon Masini
 Mr. Matthew Ply

Academic Advisor
 Dr. Thomas Pence

Team Members and Home Towns
 Chris Brzak
 Midland, Michigan

Dan Diebolt
 Grand Ledge, Michigan

Steve Wagner
 Troy, Michigan

Dave Wyrembelski
 Clinton Township, Michigan

General Motors is always looking for innovative ways to reduce the cost of producing a vehicle while improving the performance and quality of the vehicle. A seal test fixture would enable the company to evaluate promising seal concepts quickly and efficiently, decoupled from mainstream vehicle development. Successful seal sections could then be confidently integrated into a vehicle.

Matthew Ply
 GM Functional Recruiting Leader
 General Motors Corporation



Matthew Ply



Dr. Pence

A SHELL OIL COMPANY CHILDREN’S HUMANITARIAN PROJECT: DESK CHAIR TO ACCOMMODATE SPECIAL NEEDS CHILDREN

Henry H. North Elementary School is one of Lansing’s largest fully accredited elementary schools, serving as a facility for students in kindergarten through fifth grade. Henry North Elementary provides a large program for physically impaired and hearing impaired students. This program allows the students to be mainstreamed with their non-disabled peers; while receiving a high quality special education in order to succeed in their educational environment. Specifically, this project targets two students with Cerebral Palsy.

The students have Spastic Diplegic Cerebral Palsy, which means that their legs are much weaker than their arms. The result of this is that the students have difficulties getting into and out of their desk chairs. Additionally, due to their weak trunk muscles, they are not able to sit upright for extended periods of time. In the past, the teachers had to assist the students by properly positioning them once seated. This slowed down day-to-day activities and was a very time consuming task for the staff.

The goal of the project was to design and fabricate a desk chair for day-to-day use. This created a sense of independence and freedom in the classroom for the children, and as alleviated the responsibilities of the staff.

Several critical factors were identified in solving the problem: Safety, simplicity, spatial constraints, reliability, maintenance, and user friendliness. Keeping these factors in mind, the chair performs several necessary functions: rotating, translating back and forth from the desk, incorporating adjustable lateral supports, and adjustable height, width, and depth.

...The Henry H. North Elementary School Student Design Team



Vicki Pratt

Everyone enjoys being independent. Special needs children are no different. The gift of a custom designed desk chair would allow special needs students at North Elementary to be independent in the classroom. Proper positioning in the chair will also allow them to achieve academic success.

Vicki Pratt
Physical Therapist
Henry North Elementary School



Dr. Haddow

Project Sponsors
Henry H. North Elementary School
Lansing, Michigan

Shell Oil Company
Houston, Texas

Sponsor Representatives
Gretchen Garmyn
Vicki Pratt

Faculty Advisor
Dr. Alan Haddow

Team Members and Home Towns
Ratikant Behera
Pune, India

Shantanu Joshi
Troy, Michigan

Basak Oguz
Ankara, Turkey

Sandip Suvedi
East Lansing, Michigan

VAN'S AIRCRAFT VENTURE

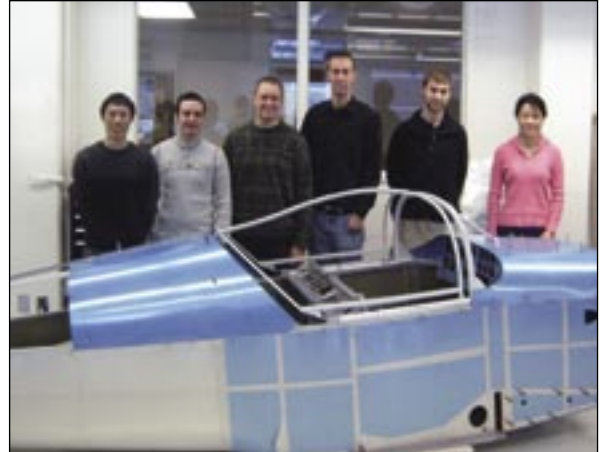
J*MT Farms* is based in Caro, Michigan. The company is family-owned, and plans to build high performance airplanes that are cost effective. Although kit plane building has become a hobby, *JMT Farms* intends to produce for profit.

The goal of this project was to provide *JMT Farms* with a start-up business plan for future production of RV-8 aircraft. Beyond that, a fully functional RV-7 aircraft was built.

The main issue regarding the design of the RV-8 aircraft was trying to provide a plane design that would appeal to the largest available market, while considering such factors as cost and FAA restrictions.

To resolve this issue, the design team contacted numerous support groups that gave the team an ideal perspective on what some pilots preferred in their aircraft.

...*The JMT Farms Student Design Team*



Project Sponsor
JMT Farms
Caro, MI

Sponsor Representative
Mr. Nicholas Montei

Faculty Advisor
Dr. Mei Zhuang

Team Members and Home Towns
Scott Dosson
Rochester Hills, Michigan

Jason Flanigan
Allen Park, Michigan

Jacob Schulz
Midland, Michigan

Chi-Hong Yung
West Bloomfield, Michigan

The results of this project will create a high performing, cost effective aircraft. This will be done through analysis of current products, assemblies, sub-assemblies and manufacturing techniques. It will also provide *JMT Farms* with a functional, full-scale prototype aircraft for testing.

Nicholas Montei
Manager
JMT Farms



Nicholas Montei



Dr. Zhuang

ASSISTIVE ACTUATION OF BRASS INSTRUMENT VALVES

Richard Moe is the pastor at St. Paul Lutheran Church in East Lansing, Michigan. As an active tuba player for over 40 years, he has performed as a part of several ensembles, including the acclaimed St. Olaf Orchestra. He continued to play in the local New Horizons adult community band after coming to East Lansing several years ago, but recently has been unable to contribute because of the advancement of spinal muscular atrophy, a degenerative muscle condition which impairs his hand movement and reduces his ability to handle the unwieldy tuba.

There were two goals for this humanitarian effort. First, the brass musical instrument needed to be augmented so that it could be operated with minimal finger strength. Second, a device needed to be developed to assist the musician with positioning of the instrument to promote beneficial posture.

The primary focus of the project was the design of a lightweight system to provide rapid and relatively silent actuation of the valves with low force input. An ergonomic support structure to comfortably adjust the tuba position relative to the user was also constructed.

Successful implementation of this system will allow individuals who lose dexterity following accidental injury or progressive disease to return to avocational or professional musical performance. This will also assist in both emotional and respiratory rehabilitation of the individual.

...The Richard A. Moe Student Design Team



Richard Moe



Mr. Hinds

This project will create a new product that will allow a person with impaired hand movement to play a brass musical instrument's valves in a silent and musical manner. It will allow individuals with impaired hand muscle function to return to avocational or professional musical performance following accident or progressive disease processes which impaired their hands in their ability to perform on their instrument. This also will assist in rehabilitation of the individual both emotionally and in respiration.

Richard Moe
Pastor, St. Paul Lutheran Church

Team Members and Home Towns

Raymond Gallagher
Ann Arbor, Michigan

Daniel Isaac
Trenton, Michigan

Zachary Kaltz
Lapeer, Michigan

Matthew Ryerkerk
Northville, Michigan

Project Sponsor

Richard A. Moe
East Lansing, Michigan

Sponsor Representatives

Dr. Robert Hubbard
Rev. Richard Moe

Faculty Advisor

Mr. Timothy Hinds

BEST-IN-CLASS GLASS RUN CHANNEL

Founded in 1908, *General Motors Corporation* is one of the largest automobile manufacturing companies, producing cars, trucks, and SUV's. *GM* has been the global industry sales leader for 75 years, manufacturing automobiles in 33 different countries. With their commitment to excellence, *GM* is dedicated to building the safest vehicles on the market.

The design team has been charged with redesigning the glass run channel. Glass run channel assemblies enable the movable door glass to slide freely in a confined channel. At the same time, the glass run channel protects the vehicle from water, dust, and wind noise when in the fully sealed position. It also stabilizes the window glass during glass movement, door closing, and vehicle operation. Glass runs are constructed of multiple materials including metal carriers, dense rubber, and flock.

The goal of this project was to develop a cost effective glass run channel with superior performance in sealing and robustness.

To achieve this goal, multiple designs were generated and analyzed in Abaqus, a finite element program. The best design was then chosen based on a balance of sealing performance, drag force, and the amount of material required.

...*The General Motors Corporation Student Design Team*



Project Sponsor
General Motors Corporation
 Warren, Michigan

Sponsor Representatives
 Jon Masini
 Matthew Ply

Faculty Advisor
 Dr. Manoochehr
 Koochesfahani

Team Members and Home Towns
 Wesley Fan
 Livonia, Michigan

Keith Pigeon
 Berkley, Michigan

Matthew Radley
 Livonia, Michigan

Chris Stevens
 Livonia, Michigan

General Motors is always looking for innovative ways to reduce the cost of producing a vehicle while improving the performance and quality of the vehicle. The glass run channel project aims to develop a low-cost glass run channel with superior performance in sealing, noise, robustness, and cost. A well-thought-out glass run channel could be used on multiple vehicles throughout the *General Motors* portfolio.

Matthew Ply
 GM Functional Recruiting Leader
 General Motors Corporation



Matthew Ply



Dr. Koochesfahani

ADAPTIVE SHOWER CHAIR

Hearthwood School, in the Ingham Intermediate School District, is a center-based program which services students with cognitive impairments, severe multiple impairments and autism. The children attending *Heartwood* are of ages three to 26. *Heartwood* encourages the participation of the parents of each student, as well as the community, in the education and development of each individual.

Students at *Heartwood* take part in weekly pool therapy in which shower chairs are utilized. The routine in which the shower chairs are used at *Heartwood* was integral to understanding the design problem at hand. Students' routines consist of either self-transfer or transfer by a teacher into the shower chair. Next, the students are transferred to the pool, where the students are then taken out of the chair into the water. After swimming, the students are transferred back into the chairs and taken to the shower room.

The goal of this project was to combine the two chair designs *Heartwood* originally used into one design. In doing this, it was necessary to solve the problems of each design. The main problems included wheel corrosion, brake malfunction, the rough and irritating texture of the seats, and the poor restraint system of the chairs. Thus, it was the goal of the design team to create one optimal design to fit the needs of the students at *Heartwood*.

To solve the problem, ten features of the two chair designs were optimized. These included a reclining chair back, variable chair height, a safe anti-tipping system, optional arm rests, water filling and draining system, anti-corrosive materials, a more durable braking system, a safe restraint system, a non-irritating seat material, and ergonomic pushing handles.

...*The Heartwood School Student Design Team*



Heartwood
School



Marcia O'Brien

This project will positively enhance the safety of approximately 35 non-ambulatory students who access the pool at *Heartwood School*, or a little less than 1/3 of our population, as well as affect the safety of approximately 20 staff members. An ergonomically proper chair/cart might also impact time efficiency, allowing students to spend more time in the pool and less time in the locker room.

Marcia O'Brien
Principal
Heartwood School



Dr. Restivo

Team Members and Hometowns

Cipto Joegiono
Medan, Indonesia

Jennifer Langridge
Mason, Michigan

Jill Randall
Clio, Michigan

Nancy Sidrak
Novi, Michigan

Project Sponsor
Heartwood School
Mason, Michigan

Sponsor Representative
Marcia O'Brien

Faculty Facilitator
Dr. Gaetano Restivo

COUPE DOOR SYSTEM – HOLD-OPEN DEVICE OPTIMIZATION

The *General Motors Corporation*, also known as *GM*, is the world’s largest car manufacturer. Founded in 1908, in Flint, Michigan, *GM* employs approximately 327,000 people around the world. With global headquarters at the Renaissance Center in Detroit, Michigan, *GM* manufactures its cars and trucks in 33 countries including 30 manufacturing facilities within the United States.

General Motors currently uses a standard side closure system for their vehicle doors that only allows a finite number of detent opening positions. This system is very inexpensive, practical, and customary; however it becomes a problem to customers when parked too close to another vehicle. Furthermore, as *GM* upgrades their vehicle, it also has a tendency to upgrade their accessories including its side closure system.

The goal of this project is to develop a working, cost-effective concept for a side closure system hold-open device capable of infinite adjustment. In essence, the objective is to create a universal door opener that will allow a car door to stay in whatever position the customer opens it to and then release when pushed/pulled closed without exceeding an applied moment constraint of 40Nm (Newton-meters) on the door. The final concept should have substantial dependency to where *General Motors* can implement the design into their existing and future vehicles, and pursue a patent on the conceptual design.

To solve the problem, two main concepts were explored: a hydraulic side closure pump system and an automatic side closure motor system. Each concept had their own unique perks and drawbacks; however, after intensive research, the hydraulic side closure pump system was identified as the most probable and efficient concept that would allow the student design team to create a working model within the given time period.

... *The General Motors Student Design Team*



Project Sponsor
General Motors Corporation
 Warren, Michigan

Sponsor Representatives
 Mr. James Karlavage
 Mr. Matthew Ply

Faculty Advisor
 Dr. Farhang Pourboghrat

Team Members and Home Towns
 Doo-Hwan Kim
 Wixom, Michigan

Fai Leung
 Hong Kong, China

Christopher Lowe
 Detroit, Michigan

Jeffrey Mann
 Sterling Heights, Michigan

This project should result in a cost effective solution that can be easily implemented into existing and future programs. The project would give customers a world-class performing side closure system capable of meeting every customer requirement, and could net incredible savings to *General Motors* by using only one check-link design for every vehicle *General Motors* manufactures. It would solve the issue of balancing “parking lot” door opening angles and all other environmental/customer uses.

Matthew Ply
 GM Functional Recruiting Leader
 General Motors Corporation



Matthew Ply



Dr. Pourboghrat

MACSTEEL BEST PRACTICE CALCULATOR

MACSTEEL is the only manufacturer in North America to offer a custom-engineered steel bar that utilizes an advanced rotary continuous casting process. Located in Jackson, Michigan, MACSTEEL carefully selects scrap steels and alloys for each order according to their customer's needs. Their rotary continuous casting and advanced ladle metallurgy allows them to consistently and efficiently produce ultra-clean steel. They are known as the most technologically advanced steel mill in the world.

After hot rolling, steel bars pass through a production line that includes turning, polishing, chamfering, surface inspection, and bundling stages. The rate at which the bars can clear the turning process currently dictates the overall production speed, making it a good place to look for improvement.

The goal of this project was to develop a best practice calculator that computes an optimal feed rate and turning head rotational velocity for any given material and geometry specification. This calculator was designed to maximize the number of steel bars that could be manufactured per unit of time, while maintaining a quality surface finish. This tool was also developed for MACSTEEL's sales and production scheduling teams with the aim of providing them with accurate estimates of production rates.

To complete this task, data had to be collected, sorted, and analyzed. Mathematical trends had to be established from these data in order to form algorithms for the calculator. Limits had to be placed on the calculator outputs in order to avoid bottlenecks in the production lines after the turning process.

...The MACSTEEL Student Design Team



Gene Longo

This project will have a huge impact on all product (MAC+) metrics. Having a tool developed for calculating feet per minute and tons per hour (TPH), sales, production scheduling, along with operations, will have a better understanding of our current barriers and how to drive the department in a more Lean Manufacturing direction. Developing evidence based best practices and having a tool designed that will have the ability to update those practices by using a standard Windows based software product will help us in the next step of our Lean Manufacturing journey.

Gene Longo
Sr. Project Metallurgist
Macsteel Jackson Division



Dr. Ki

Team Members and Home Towns

Matthew Kimball
Midland, Michigan

James Lussman
Munising, Michigan

Trevor Ruckle
Caro, Michigan

Aaron Smith
Bay City, Michigan

Project Sponsor

MACSTEEL

Jackson, Michigan

Sponsor Representative

Gene Longo

Faculty Facilitator

Dr. David Ki

Design Day Awards:

ELECTRICAL AND COMPUTER ENGINEERING

Prism Venture Partners Prize

The Prism Venture Partners Prizes (\$1,500, \$1,000, and \$500, 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. A team with members from both ECE and another engineering major (mechanical engineering, computer science) is also eligible, if the team's project is administered through ECE 480. The prizes are sponsored by Prism Venture Partners, a Boston-based venture capital firm, and Mr. William Seifert, an ECE alumnus who is a partner in that firm. The faculty and students of Electrical and Computer Engineering are very grateful for this generous support.

Last Semester's Prism Venture Prize Winners

First place: Team #04, "Meter Socket Safety Tester" sponsored by Brooks UPG



LEFT TO RIGHT: Sponsor contact Mr. Jeff Miller, Ying Tan, Hmoud Alabhool, Adam Bender, Claude Jinga, Paul Prinz and Professor Erik Goodman.

Second Place: Team #05, "Improved Mouse Controller" sponsored by DaimlerChrysler and the MSU Artificial Language Laboratory.



LEFT TO RIGHT: Kevin S. Lorenz, Bryan M. Pietrzyk, Steev Jean-Simon, Gugulethu Mabuza, Ruell Black, and Professor Erik Goodman

Third Place: Team #06, "Improved Beep Baseball" sponsored by DaimlerChrysler and the MSU Artificial Language Laboratory.



LEFT TO RIGHT: Richard May, Gary Chen Luu, Christopher P. Mosser, Matthew N. Morris, Brian R. Naeger and Professor Erik Goodman.

EGR 291 Robot Competition Award

The student team whose robot performed best in the semester's EGR 291 competition at Design Day receives this award, recognized by a plaque displayed in the Engineering Building.

Prize Winners, Fall 2006:

Erik Allar and Mike Carpenter

Professor's Choice Award:

The Professor's Choice Award (\$1,500 and a certificate) is given each semester by the faculty member teaching ECE 480, Senior Capstone Design, to the team judged to have done the most to achieve the objectives of the course and sponsor, particularly taking into account the varying levels of challenge of the projects assigned. Judging is based on reading of the teams' final reports, examination of their posters/prototypes, and communication with their faculty facilitators.

Team #01, "NASA Robotic Arm" sponsored by NASA – Goddard SFC.



LEFT TO RIGHT: Kevin Briere, Robert Walsh, Jon Noll, Shannon Nicley, and Dan Baker.

Team #07, "Whirlpool Ice Level Sensor" sponsored by Whirlpool Corporation.



LEFT TO RIGHT, Jeff Zyla, Eric Carr, Mauricio Gomes, Alex Kuhn, Ben Crowgey and Professor Erik Goodman.

Design Day Awards:

M E C H A N I C A L E N G I N E E R I N G

Thomas Alva Edison Undergraduate Design Award

The Edison Scholars recognizes the ME 481 design team that has produced the most outstanding project. A jury of experts from industry and academia evaluate the final reports, posters, and final oral presentations in determining the award winners. Funding for this award is provided by Shell Oil Company.

Leonardo DaVinci Scholars

The student team members winning the ME 471 competition at Design Day are recognized as Leonardo DaVinci Scholars. The award winners are determined by the course instructors based on team scoring in the competition.

ME 371 Kids' Choice Award:

The pre-college students participating in Design Day vote for the most outstanding ME 371 project. The winning team is designated as the Kid's Choice and is recognized with a plaque designed and manufactured by Mr. John Thon's 7th grade technology class at Holt Junior High School.

ME 371 Mechanical Contraption Award:

The best ME 371 project as determined by the faculty and students of the course receives the Mechanical Contraption Award. Judging is based on the engineering solution to the problem proposed by the student team.

ME 412 Heat Transfer Design Award:

The student team members winning the ME 412 competition at Design Day are recognized by the Heat Transfer Design Award. Instructors of the course determine team scoring based on the rules of the competition.

ME 481 Oral Presentation Award:

The best ME 481 oral presentation as determined by the ME 481 students is recognized with this award.

Last Semester's Prize Winners



ME 371 Kids' Choice Award

*Matthew Langenderfer
Daniel Little
Jonathon Luckhardt
George Mullonkal*



ME 471 DaVinci Award

*Andrew Schafer
Brandon Gilker
(Dr. Houston Brown – Shell Oil)
Gregory Schafer
Jacob Shulz*



ME481 Edison Award

*Ian Bone
Jacquelyn Rondo
Joe Kondratek
Nicholas Pash
(Dr. Kim Wilcox –Provost)*

Joint Awards

for both ME and ECE

*Both ME and ECE projects
will be eligible to win the
following awards.*

Provost's Prize:

The Provost's Prize recognizes the outstanding Senior Capstone Design Project of Design Day as judged by a panel of engineers from industry and the Deans of the College of Engineering. The winning team is selected from the winners of the Prism Venture Partners Prize and the Thomas Alva Edison Undergraduate Design Award. Judging includes reading of final reports, examination of posters/prototypes, and hearing oral presentations at Design Day.

Outstanding Poster Award:

The Outstanding Poster Award recognizes the best poster presented by any capstone design project team as judged by a team of individuals from industry and academia. Judging is based on both technical content and aesthetic layout.

*The Dart Foundation Day of Innovation
& Creativity for 7th-12th Grade Students*

SPRING 2007 PROGRAM

Time	Ballroom	Parlor B	Green Room	Gold Room A and B
9:00	Tower Building	Robotic Laser Reflections	MSU students talk about the engineering profession and life on the MSU campus Repeats at 9:45, 10:30, and 11:15	Pre-college students interview MSU teams and select the best machine in the ME 371 class
12:00	LUNCH SECOND AND THIRD FLOOR CONCOURSES			

MEMBERS OF THE ORGANIZING COMMITTEE FOR THE 7th – 12th GRADE CONFERENCE



Jill Bielawski
Michigan State University



Andrew Kim
Michigan State University



Russ Pline
Okemos High School



John Thon
Holt Junior High School

Education would be so much more effective if its purpose were to ensure that by the time they leave school every boy and girl should know how much they don't know, and be imbued with a lifelong desire to know it.

Sir William Haley
(1901–1987)

"Our future lies in some very precious hands..."

Our children are our future. Without the next generation of engineers, scientists and other professionals, the advances we enjoy today would quickly grind to a halt.

At the Dart Foundation, we are committed to developing scientifically literate students in Michigan. Therefore we are delighted to help fund the MSU Department of Mechanical Engineering's Design Day for pre-collegiate students.

An investment in our children's future will pay big dividends for this generation, and also generations yet unborn, in Michigan, America and ultimately the world.

9:00–12:00 Second Floor, Parlor B

ROBOTIC LASER REFLECTIONS

Light Amplification by Stimulated Emission of Radiation: Lasers have become an integral part of our everyday lives. We have lasers that are powerful enough to cut through metal and others that are so delicate that we can operate on the human eye with them. Lasers are used to read the CD in your computer, measure the distance to the moon, or even to trap subatomic particles. With this wide range of uses it seems that there are limitless applications for the device. In 1957 Gordon

Gould patented the idea and in 1960 Theodore Maiman made the first practical model. However, in the past 40-plus years there remains a constant challenge: How do we accurately aim them? Have you ever noticed that in some stores the cashier must aim the laser directly at the bar code and in other stores the bar code is read regardless of its position? During this build project you will confront some of the challenges that engineers face on a daily basis in our “Laser Society.”



9:00–12:00 Second Floor, Ballroom

TOWER BUILDING

Humans have been building towers since we first started erecting structures thousands of years ago. Are the pyramids simply towers with wide bases necessary to support a structure of their tremendous height and weight? Towers also hold up bridges such as the Mackinaw Bridge and the Golden Gate Bridge. Towers like the Sears Tower in Chicago are capable of housing offices, businesses, or living spaces. We also use towers to project radio signals beyond

the curvature of the earth. This is accomplished by broadcasting the signal from a great height. The higher the tower, the greater the distance of the broadcast without interference from the Earth. This brings us to our challenge today. Given limited amounts of space and material, how does an engineer design a tall tower that is able to support a load while remaining stable? You and your team will need to figure this out!



9:00–12:00 Second Floor, Green Room

HONOR SOCIETY STUDENTS TALK INFORMALLY ABOUT THE ENGINEERING PROFESSION AND LIFE ON CAMPUS



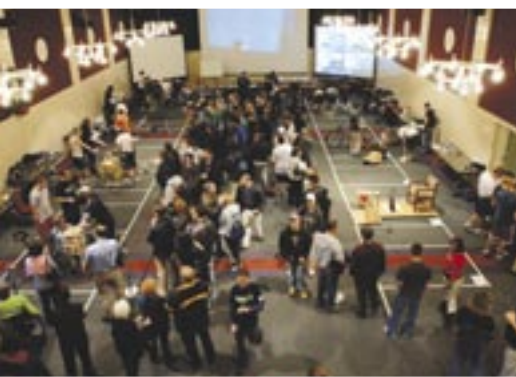
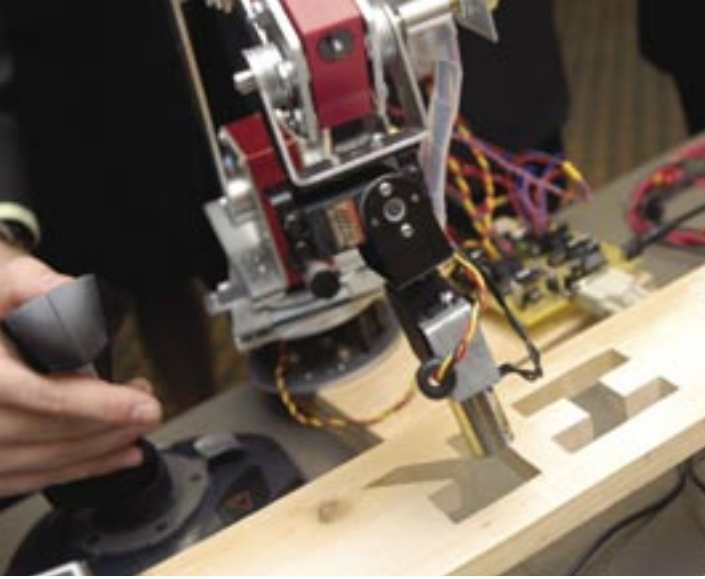
Students from the Mechanical Engineering Honor Society Pi Tau Sigma and the ECE Honor Society Eta Kappa Nu will deliver informal question-and-answer presentations on the engineering profession and campus life at 9:00, 9:45, 10:30 and 11:15. These presentations will provide the basis for seventh through twelfth grade students to ask questions and learn firsthand from the experts! So do come with your questions about the impact of engineering on society; the role of science, mathematics, and communication skills in shaping your future; how to develop good study skills; and how to get good tickets to watch the Spartans.

Pi Tau Sigma participants

Agatha Bone	Stacie Proctor
Cipto Joegiono	Andrew Schafer
Jillian Joliat	JJ Westover
Michael Nicley	Matt Winkley
Basak Oguz	

Eta Kappa Nu participants

Ali Aqel	Christina Palm
Sonny Gupta	Amit Patel
Dan Jakeway	



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A leading global supplier to the automotive industry, DENSO delivers advanced technology, systems and components that maximize vehicle safety and minimize the environmental impact of automobiles.

In North America, we have 33 facilities with more than 16,000 employees to support our customers.

Driven by excellence, DENSO manufactures a wide range of products including HVAC units, fuel pumps, power window motors, airbag sensors, starters and alternators.

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Wiper Systems



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Clusters



Instrument & Display

HVAC Units



Thermal Systems

Adaptive Cruise Control

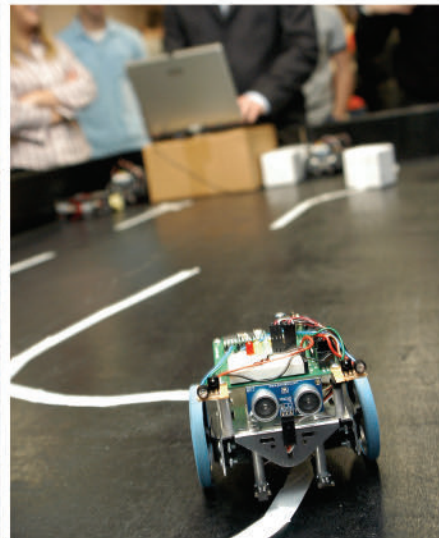
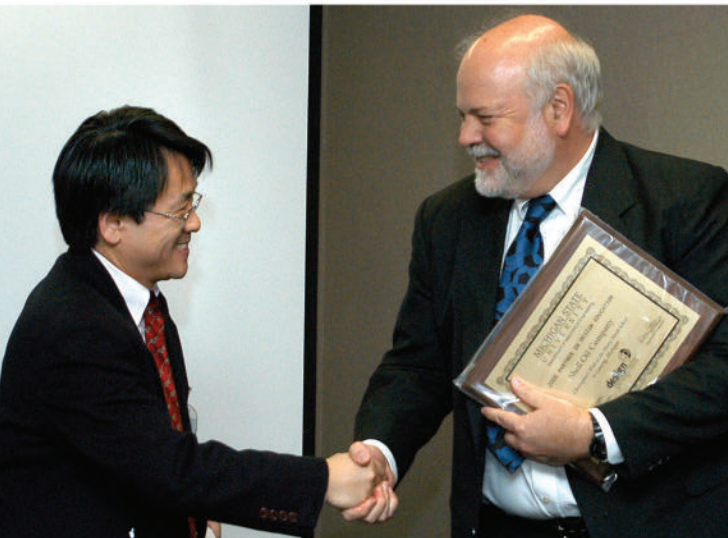
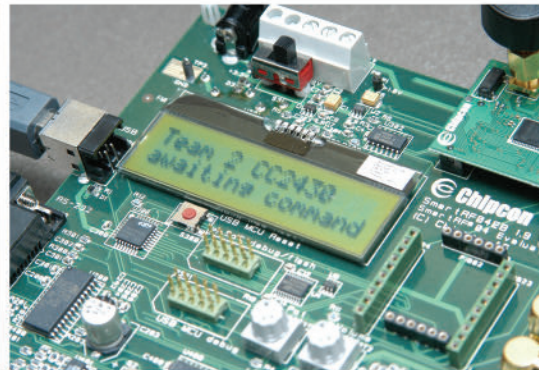
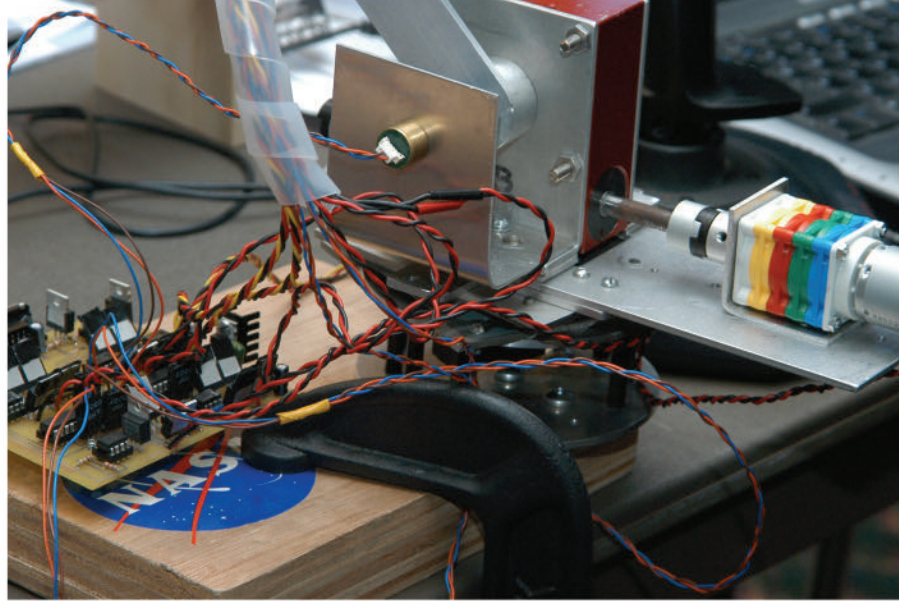


Driving Control & Safety

Navigation



ITS/Navigation



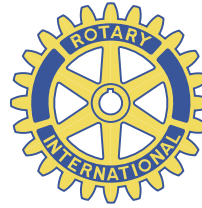
FINDING YOUR WAY TO THE UNION BUILDING...



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 and at the new MSU Grand River Avenue Parking Structure. Buses can park in the large lot south of the football stadium.

DAIMLERCHRYSLER

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MICHIGAN STATE UNIVERSITY



BEHR



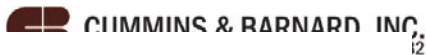
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SOLAR CIRCLE



Resource Center for Persons with Disabilities

DART FOUNDATION



BorgWarner Thermal Systems



SINCE 1905

design program