



## A note from the Design Faculty



**W**elcome to the College of Engineering Design Day. For the first time this activity stretches over two days. The Departments of Computer Science and Engineering, Electrical and Computer Engineering, and Mechanical Engineering wish you a very memorable day as our students demonstrate their amazing talents through design competitions, oral presentations, and posters. It clearly demonstrates that MSU engineers are educated to lead, create, and innovate.

As you visit our activities, please interact with our students and faculty. They are an incredible group of people who would love to share with you their accomplishments on display. To add further to the excitement of the day, approximately 400 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 and mastered.

**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, just as importantly, a professional interaction for our capstone design teams. Donors support the humanitarian projects and the operating costs of Design Day.

We thank these sponsors and donors for their support: ALCOA, Appropriate Technology Design Collaborative, Auto-Owners Insurance, BorgWarner, Center for Wireless Integrated MicroSystems, Chrysler, Consumers Energy, Crowe,

Chizek and Company, Cummins & Barnard, DEMATIC, DENSO International America, DeVilbiss Automotive Refinishing, Dymax, Ford, General Motors, IBM, Lansing Board of Water & Light, Lear Corporation, Motorola, Motorola Foundation, MSU Biogeochemistry and Paleoproteomics Laboratory, MSU Civil Engineering Infrastructure Laboratory, NASA, Norfolk Southern, O G Services, Shell Oil Company, Shenglong America, Sircon, TechSmith, UNESCO, Urban Options, Whirlpool Corporation, and Woodcreek Elementary School.

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

Enjoy!

Wayne Dyksen  
Professor  
Computer Science  
and Engineering

Craig W. Somerton  
Associate Professor  
Mechanical Engineering

Erik D. Goodman  
Professor  
Electrical and  
Computer Engineering



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## Design Day Events Schedule: Thursday, December 6, 2007

EVENTS	8 a.m.	9 a.m.	10 a.m.	11 a.m.	Noon	1:00 p.m.
Cornerstone Poster Session		Ballroom (Front) 9 a.m. - noon				
Audio Enthusiasts & Engineers		MSU Room 9 a.m. - noon				
Engineering Student Organizations		2nd Floor Concourse 9 a.m. - noon				
FIRST Robotic Team		Parlor A 9 a.m. - noon				
Middle School Wireless Thermometer Build Project		Parlor B 9 a.m. - noon				
MSU Student Panel for Middle Schoolers		Parlor C 9 a.m. - noon				
Middle School Civil Engineering Build Project		Ballroom (Back) 9 a.m. - noon				
Middle School NXT Mindstorm		Green Room 9 a.m. - noon				
Lunch for all participants			2nd Floor Concourse Noon - 12:30 p.m.			
Awards Ceremony			Ballroom 12:30 p.m.-1:00 p.m.			

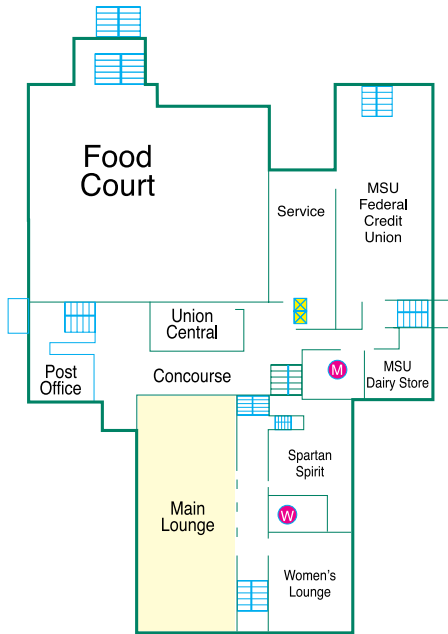
KEY:  All Participants     Middle School Event     Freshmen Engineering

# Design Day Events Schedule: Friday, December 7, 2007

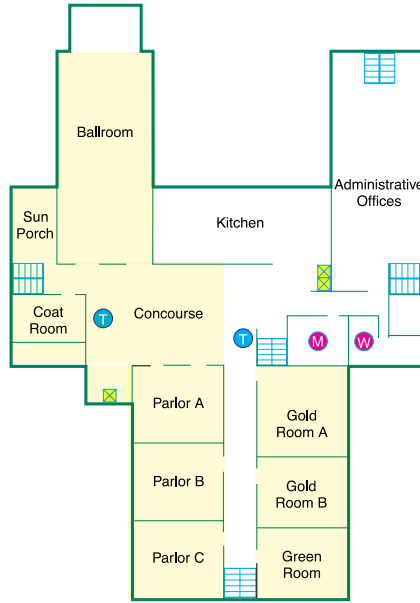
EVENTS	8 a.m.	9 a.m.	10 a.m.	11 a.m.	Noon	1 p.m.	2 p.m.
EGR 291 Robot Competition			2nd Floor Concourse 10 a.m. - Noon				
ME 371 Demonstrations		Gold A&B 9 a.m. - noon					
ME 412 Competition		Parlor A 9 a.m. - noon					
ME 471 Competition		Ballroom (front) 9 a.m. - noon					
ME 456 Presentations		Lake Ontario 9 a.m. - noon					
Audio Enthusiasts & Engineers		MSU Room 9 a.m. - noon					
ECE 480/ME 481/ CSE 498 Posters	1st Floor Main Lounge 9 a.m. - noon						
ECE 480/ME 481 Project Presentations	Lake Huron Room 9 a.m. - noon						
ECE 480/ME 481 Project Presentations	Lake Superior Room 9 a.m. - noon						
CSE 498 Project Presentations	Lake Erie Room 9 a.m. - 11 a.m.						
ME 481 Project Presentations	Tower Room 9 a.m. - noon						
College Lunch			2nd Floor Concourse 12:30 p.m. - 1:15 p.m.				
College Awards			Ballroom 1:15 p.m. - 2 p.m.				
High School Wireless Thermometer Build Project		Parlor B 9 a.m. - noon					
MSU Student Panel for High Schoolers		Parlor C 9 a.m. - noon					
High School Civil Engineering Project		Ballroom (back) 9 a.m. - noon					
High School Robotic Fish Competition		Green Room 9 a.m. - noon					
High School Lunch			Lake Erie Room Noon - 12:30 p.m.				
High School Awards			Ballroom 12:30p.m. - 1 p.m.				

KEY:  ME event     ECE event     Multi-department     High School

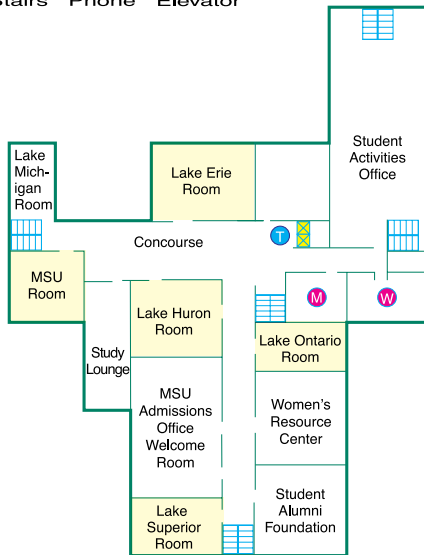
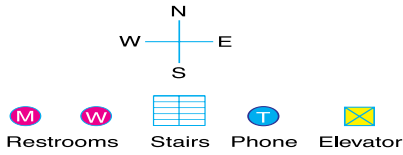
# Conference Events Schedule: Floor Maps



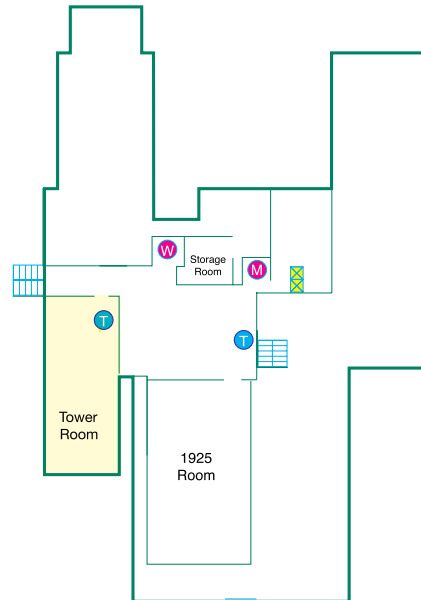
First Floor



Second Floor



Third Floor



Fourth Floor

# MSU Union Floor Plan



STATE OF MICHIGAN  
OFFICE OF THE GOVERNOR  
LANSING

JENNIFER M. GRANHOLM  
GOVERNOR

JOHN D. CHERRY, JR.  
LT. GOVERNOR

November 2007

Dear Students:

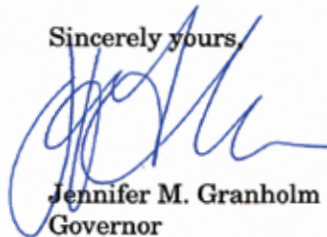
As governor of the state of Michigan, I am pleased to welcome you to Michigan State University's College of Engineering Design Day.

Engineering is a critical component as Michigan's economy transforms to meet changing global demands. Design Day is a prime example of this transformation. As the MSU Union bursts with the energy of busloads of school kids, hundreds of MSU students, dozens of faculty members and industry sponsors, the day's activities will represent a vivid example of the importance of engineering and how it helps to contribute to building a 21<sup>st</sup> century workforce.

The highlight events of the day will be the oral presentations and displays by MSU seniors that will showcase their work in mechanical, electrical and computer engineering, and computer science. I am pleased to support this wonderful event as the MSU College of Engineering helps to build the Next Michigan.

Congratulations to the senior engineering students who will be presenting their knowledge and skill, and my best wishes for an enjoyable and informative Design Day.

Sincerely yours,



Jennifer M. Granholm  
Governor



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# College of Engineering Design Day: Fall 2007

## STAFF ACKNOWLEDGEMENTS



Maureen  
Blazer-Adams  
*Design Day  
Coordinator*



Roy Bailiff



Jill Bielawski



Kelly Climer



Cathy Davison



Craig Gunn



Jillian Joliat



Debbie Kruch



Matt Luciw



Vanessa Mitchner



Garth  
Motschenbacher



Gregg Mulder



Basak Oguz



Roxanne Peacock



Adam Pitcher



Norma Teague



Teresa VanderSloot



Michael Varney



Brian Wright

### MACHINE SHOP AND DESIGN LAB STAFF:

Eliott Radcliffe

Dan Kline

Ken Barlage



# EGR 100

9:00 a.m. – Noon  
Second Floor  
Ballroom

## DESIGN OF PRODUCTS FOR COLLEGE DORM ROOMS

**INSTRUCTIONAL TEAM:** Dr. David Grummon, Mr. Timothy Hinds, Dr. Leslie Leone, Dr. Bradley Marks, Dr. George Stockman, Dr. Xiaobo Tan, Dr. Roger Wallace, Dr. S. Patrick Walton, Dr. Thomas Wolff

**TA STAFF:** Troy Hendricks, Marco Vagani

**UNDERGRADUATE MENTORS:** Emily Baker, Amy Bittinger, Gail Bornhorst, Jerome LeBoeuf, Adam Rogensues, Bryan Thomas

### PROBLEM STATEMENT

EGR 100 is a new, college-level course being piloted for the first time this semester. It is also an integral part of the Cornerstone Experience / Spartan Engineering program. The course is intended to introduce students to the engineering profession and the engineering design process through team-based, interdisciplinary design projects. EGR 100 will be taken by all incoming engineering freshmen starting fall semester 2008.

The final course project had teams of EGR 100 students design a new device or product with a retail cost of less than \$50 to be used in a dorm room by US college freshmen. The teams built prototypes of their products not exceeding a total material cost of \$20. The teams will display their prototypes at Design Day along with a poster detailing their product designs.

#### Section 1 Teams

##### Team 1

Nathan Hanna  
Kelly Roulier  
Emily Russo

##### Team 2

Andrew Franco  
Alexandra Hartford  
Miranda McKinnon

##### Team 3

Phillip Garcia  
Christopher Leonard  
Mark Zablocki

##### Team 4

Lara Dent  
Chuck Hutton  
Joseph Newlin-Haus  
Michael Skoog

##### Team 5

Michael Parr  
Alyssa Roehm  
Paul Veltri



#### Section 2 Teams

##### Team 1

Osi Aigbokhaode  
Drew Cronk  
Christine Lavery  
Cassia Miller

##### Team 2

Barbara Janiski  
Scott Johnson  
Alexander Tollis  
Cameron Walsh

##### Team 3

Benjamin Hawkins  
Conor Moglia  
Bradley Ostergren  
Jon Petersen

##### Team 4

Robert Chrisman  
Thomas Klotzbach  
James Robinette

##### Team 5

Robert Alvis  
Karl Krug  
Sri Kumar  
Michael Lask

##### Team 6

John Dark  
Austin Deneff  
Nicole Raciboski  
Chad Rogers





## FRESHMAN/SOPHOMORE ELECTRICAL AND COMPUTER ENGINEERING ROBOT COMPETITION

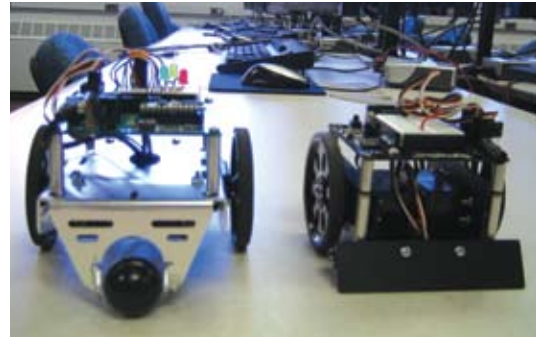
**INSTRUCTOR: Prof. Robert J. McGough**

### PROBLEM STATEMENT

EGR 291 is an elective course that introduces freshman and sophomore students to Electrical and Computer Engineering through a series of guest lectures and hands-on laboratory assignments. Some of the guest lecturers during the Fall 2007 semester include: Jennifer Jennings (MSU Center for Experiential Education and Career Exploration), Bernadette Friedrich (MSU Center for Experiential Education and Career Exploration), Shannon Hunt (Boeing), Nicole Hurley (Boeing), Dr. David Fisher (Dept. of ECE at MSU), Dean Craven (TechSmith), and Anthony Walker (TRW). The hands-on experience in EGR 291 involves weekly microcontroller-based lab assignments that utilize the BASIC Stamp.

Once the weekly lab assignments have been completed, the students form small groups for the final project, and on Design Day, the groups participate in a competition. For this semester's competition, the groups configure and program robots to navigate a maze and make decisions based on sensor inputs.

The robots are equipped with a variety of components and sensors. These include IR sensors for object detection, wheel position sensors, ultrasonic range finders, accelerometers, and RF receivers/transmitters. All interactions are coordinated by a BASIC Stamp microcontroller, which is integrated into the robot's printed circuit board.



#### Team 1

Eric Brinkman  
Andrew Dutton  
Alin Sypos

#### Team 2

Scott Friedman  
Darci Koenigskecht

#### Team 3

Greg Jones  
Nick Palm

#### Team 4

Evan Danielsen  
Tom Neil

#### Team 5

Peter Beard  
Eric Cook

#### Team 6

Kevin Colston  
Peter Peterson

#### Team 7

Alex Delgado  
Justin Moore

#### Team 8

Brad Forche  
Matt Nickell

#### Team 9

Corey Burgol  
Ryan Lattrel

#### Team 10

Stephen England  
Michael Williams

#### Team 11

Bryan Askins  
Brian Duncan

#### Team 12

Matthew Howland  
Xiaokang (Mark) Sun

#### Team 13

Devin Hunter  
Rachel Klavon

#### Team 14

Jillian Buursma  
Andrew Knapp  
David Marshall

#### Team 15

Josh Derchowski  
Michael Hilliker

#### Team 16

Dave Seaton  
Leon Voskov

#### Team 17

Joe Kuzawa  
Drew Newell

#### Team 18

Dejanea Gray  
David Rodriguez

#### Team 19

Kevin Gleason  
Prasannah Rashunathan  
Joey Weaver

#### Team 20

Ross Schwarz  
Timur Yaprak

# ME 371

9:00 – 12:00  
Second Floor  
Gold Room A & B



## PROTOTYPES OF INNOVATIVE MACHINES AND MECHANISMS

**INSTRUCTOR:**  
Professor Farhang Pourboghrat

### 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 prototypes. 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

Anabda Ruhno  
Ken Maisonville  
Matt Werner  
Jenna Sandel

##### Team 2

Adam Smith  
Anthony Dellicolli  
Matt Wolf

##### Team 3

Kim Dae Jung  
Ryan Blake  
Greg Pelkie

##### Team 4

Steve Hammack  
Mike Hines  
Kevin McAlpine  
Derek Riparip

##### Team 5

Arun Mahapatra  
Bryan Maxwell  
Eric Jackson  
Luan Huynh

##### Team 6

Kyle Elliott  
John Tysman

##### Team 7

Amy Gizicki  
Patrick Hammer  
Mike Priebe

##### Team 8

Peter Mott  
Kevin Wright  
Ryan McPhee  
Tyler Grab

##### Team 9

Joel Darin  
Steve Griffith  
Ryan Boak

##### Team 10

Justin Bauer  
Brian Steffes  
Jeff Elberling

##### Team 11

Daniel Barlach  
Tony Davis  
Fadi Yousif  
Andrew Armstrong

##### Team 12

Logan Beam  
Mike Maurer  
Kunjan Patel  
Kelly Peterson

##### Team 13

Chris Erwin  
Chris Cater  
Matt Berger  
Tyler Curtis

##### Team 14

Eric Tingwall  
Sara Murawa  
Allison Freeman

##### Team 15

Richard Hollern  
Robert Morris  
Joshua Heyden  
Scott Williams



**Shell is a proud  
sponsor of MSU's  
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# Explore it

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out there



Achieving more together



# ME 412

8:30 – Noon  
Second Floor  
Parlor A



## AIR FLOW HEAT GUN BOILER

**INSTRUCTOR:** Dr. Laura J. Genik

**TA STAFF:** Casey Allen, Matt Brzezinski,  
Xiaojian Yang, Takesha Sattiewhite

### PROBLEM STATEMENT

How much water can be boiled in 8 minutes with just hot air? That is the burning question for which the ME 412 Heat Transfer Laboratory class is designing answers. The project team, consisting of no more than three students, will design, analyze, build, and test a boiler fueled by an air flow heat gun. A 400 ml beaker must fit inside or on top of the device, with an objective to deliver energy to the water in the beaker with the hot air gun a minimum of 6 inches away from the beaker. The device will be judged on the basis of the energy delivered to the beaker of water, the mass of the device, and its cost. The device as assembled must fit inside a cardboard box of dimension 14" x 14" x 12".

TIME	STATION	DESIGN TEAM
8:55 am	B	Jay Richards, Ryan Wahula, Jillian Joliat
9:00 am	A	Samuel Leitkam, Bryan Grinnell, Thomas Kret
9:05 am	B	Adam Brzycki, Kevin Miller, Justin McIver
9:15 am	A	Patrick Grondin, Patrick Eathorne, Elliot Tippmann
9:20 am	B	Benjamin Dreher, Michael O'Connell, Andrew Kosinski
9:30 am	A	Michael MacCallum, Brandon Goad, Scott Stieber
9:35 am	B	Sylwia Poplawska, Michael Fong, Benjamin Greyerbiehl
9:45 am	A	Jordan Hauser, Evan Detone, Josh Maniago
9:50 am	B	Bradley Wackerle, David Klipfel, Joshua Thomet
10:00 am	A	Lane Taber, Vivek Reddy Sarasam, Jin Zhang Tam
10:05 am	B	Michael Balck, Anthony Piro, Joseph Obeidi
10:15 am	A	Sean Noonan, Mohd Mokhtar, Mohd Salim
10:20 am	B	Andrew Coleman, Alan Katz, Jessica Theis
10:30 am	A	Aaron Hall, Andrew Abramowski, Michael Hagedorn
10:35 am	B	Taylor Young, Dustin Henderson, Ryan Taelman
10:45 am	A	Nicole Vidro, Elizabeth Volz, Gregory Schafer
10:55 am	B	Patrick Cadigan, Aaron Butler, Arjang Gounceli
11:00 am	A	Adam Sneller, Mark Benton, Paul Streffing
11:10 am	B	Blake Gower, Andrew Howald, Evan Marks
11:25 am	A	Julie Crane, Caitlen Douthitt, David Biegas
11:30 am	B	Lindsay Bockstiegel, Mike Gyetvai, John Benghauser

## PROTOTYPES OF COMMERCIAL PRODUCTS

**INSTRUCTOR:** Professor Clark Radcliffe

**TA Staff:** Ren, Zen



### EXPERIENCE AND CREDIT

The students in this course were challenged to develop, test, and demonstrate an innovative design for a commercial product that synthesized mechanical, electrical and fluidic components plus imbedded microcontrollers. Typical applications range from automotive engine controls and robotic manufacturing systems to toys and consumer appliances such as microwave ovens. Each group will make a 15-minute presentation and demonstration of a working prototype of their product.

### Mechatronics Systems Design

---

TEAM	TIME	MEMBERS
Team 1	9:10	Adam Sneller, Basak Oguz, Kyle Lehrmann, Sean Steffer
Team 2	9:30	Blake Gower, Evan Marks, Jay Richards, Ryan Taelman
Team 3	9:50	Brian Smith, Daniel Little, Keith Bury, Richard Henderson
Team 4	10:10	Andrew Kosinski, Bryan Wagenknecht, Martin Priess
Team 5	10:30	Brian Powell, Chad Glinsky, Erik Marshall, Michael Booth
Team 6	10:50	Andrew Hartsig, Jacob Wagner, John Benghauser, Michael Balck
Team 7	11:10	Adam Grisdale, Christopher Sweeney, Kyle Koepf
Team 8	11:30	Bryan Grinnell, Kyle Szykiel, William Smits

# ME 471

9:00 – Noon  
Second Floor  
Ballroom



Haddow



Siefert

## WINROBO

**INSTRUCTORS:** Professor Alan Haddow  
and Mr. Andrew Siefert  
**TA Staff:** Rouhollah Jafari

### PROBLEM STATEMENT

Throughout the semester student teams have worked on designing, building, and testing robots that could clean a residential double-hung sash window. This design problem was posed in the form of a competition, where the teams compete against each other this morning. Each team has to demonstrate a proof of concept design that is capable of cleaning “dry erase” ink from the windowpanes. The designs are subject to a number of constraints, such as a weight limit of 1kg and certain size restrictions. Additional points are awarded if the cleaning is done autonomously and if all the dry-erase dots are cleaned within the time limit of 5 minutes. Teams will have to complete two test runs as outlined in the table below.

Time	Window	Team	Team Members
9:00	A	1	Shangyun Shi, Jin Tam, Boon Yong
9:05	B	2	Emily Duszynski, Kyle Koepf, Jonathan Luckhardt, Joshua Thomet
9:10	A	3	Adam Alderman, Paul Crockett, Neal Spitzley
9:15	B	4	Hani Kobty, Sergey Korobov, Justin Rumao
9:20	A	5	Brandon Bouchard, Justin Bradford, Carl Coppola
9:25	B	6	Andrew Gryczan, Johannes Hertrich, Martin Priess
9:30	A	7	Christopher Caffee, Brian Smith, Bryan Wagenknecht
9:35	B	8	Luis Goncalves, Justin Milburn, Donald Snyder
9:40	A	9	Erik Marshall, Zachary McIntyre, Christopher Meyers
9:45	B	10	Michael Cooper, Pinal Desai, Ravi Jadia
9:50	A	11	Chad Glinsky, Keith Tenbusch, Nicole Vidro
9:55	B	12	Michael Booth, Marcos Colon, Brian Powell, John Woodruff
10:00	A	13	Nicole Arnold, George Mullonkal, Brandon Quaranto
10:05	B	14	Scott Slingerland, Lisa Chapman, Kipp Wallace
10:30	B	1	Shangyun Shi, Jin Tam, Boon Yong
10:35	A	2	Emily Duszynski, Kyle Koepf, Jonathan Luckhardt, Joshua Thomet
10:40	B	3	Adam Alderman, Paul Crockett, Neal Spitzley
10:45	A	4	Hani Kobty, Sergey Korobov, Justin Rumao
10:50	B	5	Brandon Bouchard, Justin Bradford, Carl Coppola
10:55	A	6	Andrew Gryczan, Johannes Hertrich, Martin Priess
11:00	B	7	Christopher Caffee, Brian Smith, Bryan Wagenknecht
11:05	A	8	Luis Goncalves, Justin Milburn, Donald Snyder
11:10	B	9	Erik Marshall, Zachary McIntyre, Christopher Meyers
11:15	A	10	Michael Cooper, Pinal Desai, Ravi Jadia
11:20	B	11	Chad Glinsky, Keith Tenbusch, Nicole Vidro
11:25	A	12	Michael Booth, Marcos Colon, Brian Powell, John Woodruff
11:30	B	13	Nicole Arnold, George Mullonkal, Brandon Quaranto
11:35	A	14	Scott Slingerland, Lisa Chapman, Kipp Wallace



# CSE 498 Collaborative Design

*Professor Wayne Dyksen*

CSE 498, Collaborative Design, provides the educational capstone experience for all students majoring in computer science. The course objectives include the following:

- Learning to architect, develop, and deliver a comprehensive software system to a client;
- Learning to work effectively in a team environment;
- Developing written and oral communication skills;
- Becoming proficient with software development tools and environments;
- Learning about system building and system administration; and
- Considering issues of professionalism and ethics.

Corporate clients are local, regional, and national, including Accident Fund, Auto-Owners Insurance, Boeing, Chrysler, Ford, GM, IBM, Microsoft, Motorola, Sircon, TechSmith, and the Union Pacific Railroad.

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# ECE 480 Senior Capstone Design

*Professor 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, accommodation issues, and entrepreneurship.
- Polishing their communication skills – individual and team – on proposals, reports, resumes, evaluations, posters, web pages, and oral presentations.
- Requiring each student to complete four individual hardware/software laboratory assignments.

Team sponsors are local and national, including BorgWarner, Bosch, Chrysler, Instrumented Sensor Technologies, Lear, NASA GSFC, Texas Instruments, Whirlpool, and MSU's Resource Center for Persons with Disabilities.

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# ME 481 Mechanical Engineering Design Projects

*Professor Craig Somerton*

ME481 is required for all mechanical engineering majors at MSU.

The course provides students with a team-based capstone design experience:

- Using 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.
- Collaborating with practicing engineers to address problems sponsored by industry.
- Developing new products or re-designing existing products to reduce costs or enhance reliability.

- Interacting with large, medium-sized, and small companies involved in orthodontic devices, furniture, aerospace structures, automotive parts, 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.

Project sponsors include Lansing Board of Water & Light, General Motors, Lear, DEMATIC, Consumers Energy, Motorola, Whirlpool, Cummins & Barnard, DeVilbiss Automotive Refinishing, Shell, and Shenglong America.

## MECHANICAL AND ELECTRICAL ENGINEERING DESIGN PROJECTS

### PRESENTATION SCHEDULE – Lake Huron Room

Course Coordinators: Prof. Erik Goodman and Prof. Craig Somerton

Faculty Advisors: Professors Ayres, Bénard, Engeda, Haddow, Khalil, Mason, Patterson, Somerton, and Thompson

Time	Project Sponsor(s)	Sponsor Contact(s)	Faculty Advisor(s)	Project Title
8:00 Huron Room ECE 480	NASA	M. Comberiate	H. Khalil	Vision-guided Control of Simple Robots from a “Mother Ship”
8:25 Huron Room ECE 480	Borg Warner Thermal Systemss	J. Roby	V. Ayres	Miniaturization and Redesign of Fan Drive Speed Control Circuit
8:50 Huron Room ECE 480	Dymax Engineering	G. Keates	A. Mason	Best Development of a Caught in the Dark Relay Trip Warning System
9:15 Huron Room ME 481	Shell Oil Company	J. Wise	A. Haddow	Shell Oil Company Children’s Humanitarian Project: Floor Hockey Walker for Joseph Wise
10:00 Huron Room ME 481	Urban Options and Woodcreek Elementary	J. Meyerle D. Graham S. Raymer	C. Somerton	Motorola Youth in Energy and Environment Humanitarian Project: Solar Heated Worm Compost Bin
10:25 Huron Room ME 481	Shenglong America	T. Droste	A. Engeda	Pump Test Stand with Regenerative Hydraulic Power
10:50 Huron Room ME 481	Motorola	J. Wojack	E. Patterson	Design and Development of a New Slider Mechanism for Cell Phones
11:15 HuronRoom ME 481	Whirlpool Corporation	J. Martin	A. Bénard	Eco-efficiency Laundry Appliances
11:40 Huron Room ME 481	The Appropriate Technology Design Collaborative	J.Barrie	B. Thompson	Vaccine Cooling for Remote Region

# NASA: VISION-GUIDED CONTROL OF SIMPLE ROBOTS FROM A "MOTHER SHIP"

**M**an is a natural explorer; however, there are many places where man simply cannot go. We hope to facilitate unmanned exploration by continuing the development of vision-guided control of simple robots from a mother ship. This project is an extension and refinement of research and design work by current and previous teams from Michigan State University and the University of Maryland, under sponsorship of *NASA Goddard Space Flight Center*.

The design goal is to take 3D scans of the terrain and stitch them together to create a top-down 3D view. Then sampling destinations and routes will be determined remotely, and the mother ship will communicate with the robots to give a course of action. The robots will move toward their assigned locations, while additional scans by the mother ship, including of the robots being controlled, are stitched together to determine the robots' positions and fine-tune their instructions, until the final sampling destinations of the robots are achieved. The LADAR unit on the mother ship will be fitted with a stepper motor to decrease any distortions in the 3D image caused by motion during the scan, the robots will be fitted with ultrasonic sensors to avoid collisions with moving objects, and Wi-Fi will be used for communication between the mother ship and robots.

The final design will be tested by *NASA* in Antarctica and Alaska for use in low-temperature environments.

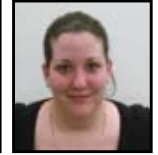
<http://www.egr.msu.edu/classes/ece480/goodman/fall/group08/>



M. Schall  
Computer Eng



V. Pribadi  
Computer Eng



A. Mathes  
Electrical Eng



E. Harper  
Computer Eng



R. Zhang  
Electrical Eng



**Project Sponsor**  
*NASA Goddard Space Flight Center*

**Sponsor Representative**  
Mr. Michael Comberiate

**Faculty Facilitator**  
Prof. Hassan Khalil

**Team Members and Non-Technical Roles**  
Mark Schall  
*Manager*

Vico Pribadi  
*Webmaster*

Amber Mathes  
*Documentation Prep*

Eboni Harper  
*Presentation Prep*

Rui Zhang  
*Lab Coordinator*



Mr. Comberiate



Prof. Khalil

# BORGWARNER THERMAL SYSTEMS: MINIATURIZATION AND REDESIGN OF FAN DRIVE SPEED CONTROL CIRCUIT

The Team 9 design project is sponsored by Borg Warner Thermal Systems, Marshall, MI. They want to be able to integrate a fan-speed control circuit within their fan systems. This project is an extension of a previous design project with a real-world application. The previous team developed a circuit that controls the engine fan speed by using parameters from the Engine Controller Unit (ECU). Communication between the ECU and the fan clutch is accomplished by using the Controller Area Network (CAN) protocol. The position of a solenoid valve adjusts the amount of oil pressure applied to the clutch and in turn changes the fan speed.

The goal for our team is to redesign and miniaturize the previous circuit so that it fits in a tube 34 mm in diameter by 40 mm in length. The circuit miniaturization involves replacing existing components with smaller ones and in some instances replacing components with new ones that perform the same function. The circuit must operate in an extended temperature range (-55°C to 150°C), with the exception of the microcontroller, which only needs to operate up to 125°C. Since the circuit will be operating in high temperatures, dissipating heat from the components is extremely important. The circuit will also operate near a solenoid; therefore, it will need to be able to function properly in the presence of a magnetic field.

The microcontroller is responsible for the computations and decisions made. Parameters from the ECU are communicated to the microcontroller and multiple algorithms are used to determine the desired fan speed. Testing is accomplished using a Graphical User Interface (GUI) to observe and confirm the speed of the fan.

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



M. Uno  
Electrical Eng

N. Battle  
Electrical Eng

M. Koenigsknecht  
Electrical Eng



Mustafa Zunic  
Computer Eng

Christopher Williams  
Electrical Egr



Mr. Roby



Prof. Ayres



**Project Sponsor**  
Borg Warner Thermal  
Systems

**Sponsor  
Representative**  
Mr. Josh Roby

**Faculty Facilitator**  
Prof. Virginia Ayres

**Team Members and  
Non-technical Roles**  
Yuhei Uno  
Manager

Matthew Koenigsknecht  
Webmaster

Christopher Williams  
Documentation Prep

Nicholas Battle  
Presentation Prep

Mustafa Zunic  
Lab Coordinator

# DYMAX ENGINEERING: CAUGHT IN THE DARK RELAY TRIP WARNING SYSTEM

In the power industry, there are literally hundreds of thousands of electro-mechanical protective relays protecting transmission circuits, distribution circuits, substations and generation stations. In a generation plant, there may be as many as twenty or more relays protecting a single generator and its prime mover.

There is a problem when a relay trips and there is a significant time delay between that trip and the operator's detecting the trip. The purpose of this project is to develop a reliable but inexpensive method whereby a change in state of an individual relay can be sensed, then that change of state be sent to a computer and be rapidly reported to the operator.

Adding a current probe sensor to the relay will allow information about the relay to be sent to a computer. This upgrade is very useful in the power industry. This low-cost solution avoids time-consuming modifications to existing relays being used in the field. The information will be processed with a PIC microcontroller and output to a GUI.

<http://www.egr.msu.edu/classes/ece480/goodman/fall/group10/>



M. Wesley  
Electrical Egr

K. Proctor  
Electrical Egr

E. Kubacki  
Computer Egr



M. Seal  
Electrical Egr

J. McCann  
Electrical Egr



**Project Sponsor**  
*Dymax Engineering*

**Sponsor Representative**  
Mr. Glenn Keates

**Faculty Facilitator**  
Prof. Andrew Mason

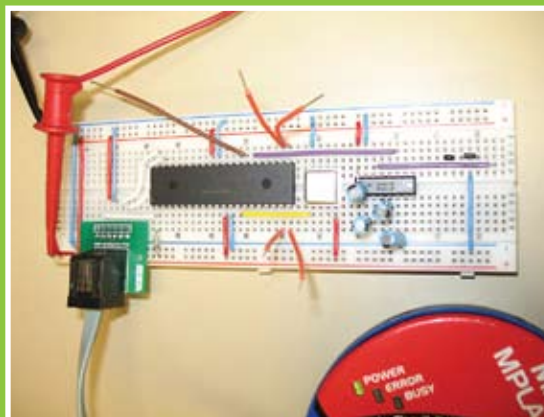
**Team Members and Non-technical Roles**  
Matt Wesley  
*Manager*

Eric Kubacki  
*Webmaster*

Mark Seal  
*Documentation Prep*

Kyle Proctor  
*Presentation Prep*

Jerry McCann  
*Lab Coordinator*



Mr. Keates



Prof. Mason



## A SHELL OIL COMPANY CHILDREN'S HUMANITARIAN PROJECT: FLOOR HOCKEY WALKER FOR JOSEPH WISE

Joseph Wise is an 11-year-old boy who has Cerebral Palsy. This neurological disorder is caused by abnormalities in parts of the brain that permanently affect body and muscle movement. While this situation could hinder an individual's will to be active, Joe makes it a point to partake in numerous activities. Throughout the course of his childhood, Joe has found a love for the sport of hockey. Although Cerebral Palsy has limited the use of his legs, he is determined not to let the current design flaws in his walker affect his ability to participate in floor hockey.

Currently, the walker that Joe uses for floor hockey does not stand up to the rigors of the game. The main issue affecting his participation is that the handles have a tendency to fall off and they are positioned too far forward, promoting unhealthy posture. Other major flaws in the current walker include wheels coming loose during everyday activity and plastic hinges breaking. In addition, the fasteners are insufficient and the walker does not collapse to a desirable size.

The main objective was to create a walker for Joe that would withstand the game of floor hockey and be functional for everyday activities. Successful completion of this project would allow Joe to play floor hockey at a higher level. Due to the open-ended nature of this project, there were numerous possibilities discussed. Upon analysis of the possibilities, an optimal design was chosen and pursued.

...*The Joseph Wise Humanitarian Design Team*



Joseph Wise

I am very excited about my new walker because it will make it easier for me to play floor hockey and control the puck. I hope it can help me get through the snow in the winter time. I am excited about not having to worry about tipping over. It will be fun to be able to keep up with the other kids and get around better on the playground when I go outside at recess. GO STATE!

- Joseph Wise



Prof. Hadow

**Project Sponsors**  
**Shell Oil Company**  
Houston, Texas

**Professional Advisor**  
Mr. Joseph Wise

**Faculty Advisor**  
Prof. Alan Hadow

**Team Members and Home Towns**  
Patrick Eathorne  
New Hudson, Michigan

Brandon Goad  
Birmingham, Michigan

Patrick Grondin  
Milford, Michigan

Mike MacCallum  
Birmingham, Michigan

Josh Maniago  
Rochester, Michigan

# THE MOTOROLA YOUTH IN ENERGY AND ENVIRONMENT HUMANITARIAN PROJECT: SOLAR HEATED WORM COMPOST BIN FOR WOODCREEK ELEMENTARY SCHOOL

**U**rban Options is a non-profit community agency that provides energy and environmental information and services. The main purpose of the organization is to improve the environmental quality of Urban Spaces. This goal is achieved by educational programs, as well as home and yard improvement demonstrations.

Woodcreek Magnet Elementary School is one of four elementary schools participating in an outside worm compost bin program. As a Magnet Elementary School, the curriculum focus is math, science, and technology. Teachers consistently incorporate hands-on materials and activities to help students grasp technical concepts. This project is a complementary addition and key component to the fifth grade curriculum at Woodcreek.

During the warm months of the year the worms consume the lunch waste and produce compost. Worm composting is a beneficial process because it reduces the amount of natural waste that would otherwise be put into a landfill. Throughout the winter months, however, the worms become inactive and composting ceases. The designed system utilizes solar energy to warm the compost bin during the winter months, allowing the worms to continue their function.

An essential aspect of this project was to engage the fifth grade class in the design process. Students were involved in the development, design, and construction of the system. Several topics were presented to the class during the semester such as: basics of energy, solar energy, the engineering

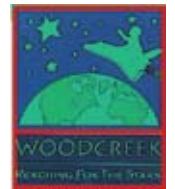


design method and the engineering profession. A website was also created to facilitate effective communication between all parties involved.

The intent of this project was to provide Woodcreek students with valuable exposure to alternative energy in order to establish young leaders with an extensive knowledge of sustainability. It is anticipated that this revolutionary solar powered worm compost bin will be duplicated at other elementary schools around the country. Urban Options, Woodcreek Elementary and Michigan State University hope that this project will serve as a step towards a sustainable future. ...Urban Options/Woodcreek Elementary Student Design Team



**MOTOROLA**



## Project Sponsor

**Urban Options**

East Lansing, Michigan

**Woodcreek Elementary**

East Lansing, Michigan

## Professional Advisors

Mr. Jim Meyerle

Ms. Diane Graham

Ms. Sandy Raymer

## Faculty Advisor

Prof. Craig Somerton

## Team Members and Home Towns

Caitlen Douthitt

Plymouth, Michigan

Jillian Joliat

Troy, Michigan

Matt Langenderfer

Temperance, Michigan

Brad Wackerle

Pinconning, Michigan

All team members are co-creating what we believe will be the first solar powered worm bin in the world! Not only will the solar heated bin help the red worms continue to consume organic material during the cold Michigan winters but the carefully designed system which has emphasized simplicity but effectiveness could be easily duplicated at other school sites in the U.S. and Canada.

-Jim Meyerle, Education Program Director, Urban Options

Our fifth grade class has made a tremendous shift from traditional teacher instruction to collaborative learning. The Solar Worm Bin Project has given our fifth graders the opportunity to think and work alongside 'real' engineers. This project has captured the imagination and interest of our fifth graders by actively involving them in the design process. It's a positive experience that builds not only their understanding of the elements of engineering but gives them practice in teamwork and helps them to see that they indeed can work together to find solutions to help our environment.

-Diane Graham, Teacher, Woodcreek Elementary School



Mr. Meyerle



Ms. Graham



Ms. Raymer



Prof. Somerton



# SHENGLONG AMERICA: PUMP TEST STAND WITH REGENERATIVE HYDRAULIC POWER

**S**henglong America is one of many subsidiary companies of Ningbo Shenglong Group; a Chinese based manufacturing company formed in 1996. Ningbo Shenglong Group is contracted by both Chinese and American companies predominantly for automotive components with some affiliation in aluminum-alloy casting machines, air-conditioning units, and pneumatic tools. All of Ningbo Shenglong Group subsidiaries take great pride in providing products and services that meet and exceed their customer's expectations.

A provider of engine oil pumps to Ford Motor Company; Shenglong America has been sourced to design a test stand to perform a design verification (DV) test for an automatic transmission pump with power take off (PTO). This project is for Ford's heavy duty 6R140 transmission; available in 2011. Tim Droste, the technical manager, has delegated the test stand design and construction to Petra Technologies and Sector Engineering, Inc. These companies provide expertise in hydraulic and electrical controls.

To reduce development costs, the Shenglong America Student Design Team was given the job of designing a regenerative hydraulic circuit for use in the test stand. The circuit will provide proper testing conditions while minimizing project costs. The regenerative hydraulic circuit uses energy provided by the PTO to aid a 30 hp motor; which drives the automatic transmission pump. This creates the same amount of torque that a conventional direct drive 125 hp motor would provide; thus substantially decreasing project costs. Hydrasoft's HYSAN -hydraulic simulation software- was used to perform transient and steady state analysis of power flow and pressure fluctuations. Transient analysis was referred to throughout the design process in order to reduce iterative prototyping costs. The estimated costs savings to Shenglong America amount to \$30,000-\$40,000 per test stand.

...The Shenglong America Student Design Team



Mr. Droste



Prof. Engeda

Automatic transmissions use hydraulic pumps to complete comprehensive sets of DV tests. Most DV test stands are designed to power 5-20 hp pumps. The MSU student design team will increase the power of the effective test stand to allow it to perform a DV test of a 125 hp PTO. The team must make all changes to the test stand at a minimum cost and without making significant changes to the test stand's hydraulic, pneumatic or electrical systems. No change shall be made to the electric power supply, or the shop floor "footprint" of the existing test stand area. Along with initial cost savings, the SAE J2311 compliant test stand will provide applications for future DV tests with different design specifications.

Timothy Droste  
Technical Manager  
Shenglong America

### Project Sponsor Shenglong America

Division of :  
Ningbo Shenglong Group  
Ningbo, China

### Professional Advisor Mr. Timothy Droste

### Faculty Advisor Prof. Abraham Engeda

### Team Members and Home Towns

Adam J. Brzycki  
Olivet, Michigan

Laura B. Daly  
Troy, Michigan

Kevin M. Miller  
Charlotte, Michigan

Alison K. Solomon  
Kentwood, Michigan





# MOTOROLA: DESIGN AND DEVELOPMENT OF A NEW SLIDER MECHANISM FOR CELL PHONES

**M**otorola was originally called Galvin Manufacturing Corporation when it was founded by Paul and Joseph Galvin in 1928. However, in 1947 the name was changed to *Motorola* as the company's primary focus was on developing electronics for automotive applications. Today, *Motorola* manufactures a wide range of products that include microprocessors, satellite systems, and modems. One of the largest markets that *Motorola* has been able to tap into is the cellular phone industry after introducing the first cellular phone device in 1983.

There are three major categories that cell phones tend to fall into: candy bar, flip phones, or slider phones. *Motorola* currently offers several varieties of candy bar and flip phones but only has a few slider phones available in the market. Typically, most slider mechanisms used in the phones are very much the same in terms of their design and this leads to limited variation.

The main goal of this project was to develop a “new and unique” slider mechanism for cellular phones with a focus on improved performance that includes greater smoothness, a reduced dead zone, a relocated transition point and better reliability.

...*The Motorola Student Design Team*



**MOTOROLA**

**Project Sponsor**  
*Motorola*  
Libertyville, Illinois

**Professional Advisor**  
Mr. Jason Wojack

**Faculty Advisor**  
Prof. Eann Patterson

**Team Members and Home Towns**  
Bryan Cooper  
Okemos, Michigan

Julie Crane  
Clarkston, Michigan

Michael Hundt  
DeWitt, Michigan

Uday Mathur  
New Delhi, India

The development of a new and improved slider mechanism aligns with *Motorola's* ambition to develop compelling mobile devices that allow consumers to be more productive. The goal of this project will be to create a new paradigm for how a mobile phone slider is designed.

-Jason Wojack  
Principle Staff Mechanical Engineer  
*Motorola*



Mr. Wojack



Prof. Patterson

# WHIRLPOOL: ECO-EFFICENCY LAUNDRY APPLIANCES

**W**hirlpool is a well-known manufacturer of appliances used throughout the home. This Fortune 500 company, founded in St. Joseph, Michigan, continues to lead the market in the fabric care industry. Since their initial development, they now have expanded their production and have become a globally recognized brand. Whirlpool's main goal in this eco-efficiency project is to continue innovation in their products to further reduce energy costs and water usage for the customer's home.

Recent government encouragement and increased consumer concern for the environment drives the need for a high efficiency laundry cycle. Clothes dryers can account for a large portion of energy consumed in the laundry cycle and offer a great deal of room for efficiency gain. Improving the efficiency of this appliance can ultimately save consumers money and reduce their impact on the environment.

This project explored technology to minimize the energy consumed by a dryer by up to 75 percent. Research was aimed toward reusing and reducing the heat from the exhaust air or eliminating the exhaust completely. Other areas of investigation involved microwave drying and heat pumps.

Designs were explored, tested, and compared in order to derive the best energy-saving solution. Research into each of the possible designs was conducted by exploring current products, technical publications, and related research projects. Designs were compared using thermodynamic and heat transfer modeling to determine an optimal design. The final solution will be pursued and prototyped by a team in the coming semester.

...The Whirlpool Student Design Team



Ms. Martin

Water and energy efficiency are quickly emerging as top drivers for consumer value. In order to maintain competitive advantage and support the needs of consumers, Whirlpool is looking to develop innovative products that apply new technologies and design to the washer and dryer for drastically improved water and energy efficiency.

-Julie Martin, Whirlpool Corporation



Prof. Bénard

**Project Sponsor**  
**Whirlpool Corporation**  
Benton Harbor, Michigan

**Professional Advisor**  
Ms. Julie Martin

**Faculty Advisor**  
Prof. Andre Bénard

**Team Members and Home Towns**  
Daniel Cassar  
Waterford, Michigan

Brandon Gulker  
Holland, Michigan

Justin McIver  
Stevensville, Michigan

Greg Schafer  
Adrian, Michigan

# THE APPROPRIATE TECHNOLOGY DESIGN COLLABORATIVE: VACCINE COOLING FOR REMOTE REGION

Over two billion people live without access to electricity. Another billion live with unreliable power in squatter settlements. Much of rural Africa, Asia, and Latin America live so far from power that refrigeration is the limiting factor in the distribution of medical supplies. Conditions are not improving. In Africa, the population is increasing faster than rural electrification.

Vaccines must be kept cold to maintain their potency. Vaccinations in rural areas depend on time limited technologies such as ice, dry ice, and cold storage boxes. As a result, 50% of rural vaccines are wasted through spoilage due to lack of cooling. Public health suffers as a quarter of all children born every year—34 million infants—are not protected against diseases for which there are inexpensive vaccines and an estimated 2.1 million people around the world die every year of diseases preventable by common vaccines. (WHO 2005)

The goal of this project is to design and fabricate an inexpensive appropriate technology freezing chamber that can be made primarily from locally available resources in rural Africa and Asia. The purpose of this design is to produce ice so that vaccines can be maintained at the proper temperature of between 2°C and 8°C. This design should not rely on grid connected power. All other technologies should be considered, however the simpler the technology the better.

The final design will be licensed through Creative Commons. The Appropriate Technology Design Collaborative is actively seeking funding to produce demonstration prototypes in Africa. Mr. Souleymane Kone of The World Health Organization, Department of Immunization, Vaccines and Biologicals will be reviewing and commenting on this project.

...*The Appropriate Technology Design Collaborative Student Design Team*



The Appropriate Technology Design Collaborative

**Project Sponsor**  
*The Appropriate Technology Design Collaborative*  
Ann Arbor, Michigan

**Professional Advisor**  
Mr. John Barrie

**Faculty Advisor**  
Prof. Brian Thompson

**Team Members and Home Towns**  
Andy Coleman  
Lansing, Michigan

Alan Katz  
Okemos, Michigan

Lindsay Kredon  
Sterling Heights, Michigan

Jessica Theis  
St. Johns, Michigan

Extending the shelf life of vaccines through the design and prototyping of a simple freezing chamber will save lives. It will greatly help expand vaccination programs, improve public health, and contribute to the eradication of disease. Additional benefits include preserving food so that farmers can get more of their produce to markets and for home owners to preserve food for their families. This design may even be used to help small businesses cool beverages.

-John Barrie,  
*The Appropriate Technology Design Collaborative*



Mr. Barrie



Prof. Thompson

## ELECTRICAL AND MECHANICAL ENGINEERING DESIGN PROJECTS

### PRESENTATION SCHEDULE –Lake Superior Room

Course Coordinators: Prof. Erik Goodman and Prof. Craig Somerton

Faculty Advisors: Professors Aviyente, Brown, Gokcek, Khalil, Li, Mahapatra, Shaw and Strangas

Time	Project Sponsor(s)	Sponsor Contact(s)	Faculty Facilitator	Project Title
8:00 Lake Superior Room ECE 480	Midland Rotary Club, MSU RCPD and Chrysler Automotive	K. Mead S. Blosser	T. Brown	Beep Baseball Redesign of the Base Set
8:25 Lake Superior Room ECE 480	MSU RCPD, Midland Rotary Club and Chrysler Automotive	S. Blosser	S. Aviyente	Portable Audio-visual Book Reader
8:50 Lake Superior Room ECE 480	MSU Department of Zoology	D. Ostrom	C. Gokcek	Trace Gas Sample Introduction System: Part of the Field-Deployable Isotope Mass Spectrometer
10:00 Lake Superior Room ECE 480	Chrysler Automotive and UNESCO	K. Scheel	T. Li	Mondialogo Medical Diagnosis System
10:25 Lake Superior Room ECE 480	JMT NSF/WIMS ERC (Wireless Integrated Microsystems Engineering Research Center)	D. Aslam	N. Mahapatra	Wireless RFID Reader/Writer for WIMS Robot Tabletop Factory
10:50 Lake Superior Room ECE 480	WIMS ERC (Wireless Integrated Microsystems Engineering Research Center)	D. Aslam	H. Khalil	Obstacle-avoiding Wall-climbing Robot
11:15 Lake Superior Room ECE 480	Lear Corporation	W. Maue J. Natham	E. Strangas	Motor and Gearing Selection Program
11:40 Lake Superior Room ME 481	Lear Corporation	W. Maue J. Natham	S. Shaw	Advancement of Desk Chair Technologies for Children with Cerebral Palsy

# MSU RCPD, CHRYSLER AND MIDLAND ROTARY CLUB: BEEP BASEBALL REDESIGN OF THE BASE SET

**B**eep baseball is quickly growing in popularity. Since its conception in the mid 1960s, this game has allowed people who lack complete sight to still participate in this country's national pastime: baseball.

Design Team 1's challenge for this semester was to redesign the current set of bases. One of the major drawbacks of the current set of bases is that they lack wireless functionality. This means that wires have to be strung every time a game is played. This leads to dangerous situations when runners approach the wires as well as major inefficiency in setting up the games. To resolve this issue, our group's main focus was to implement a wireless interface for the bases. Additionally, shipping costs for the current set of bases is extremely high. To lower these shipping costs, our design team decided to make the column section of the base inflatable. This will allow us to deflate the base, lowering the weight and reducing the size which will lower the costs of shipping.

Another major concern in the redesign of the bases was that we needed to have the base emit a sound that is clearly heard and distinguished by the players. Since the beep baseball creates sounds pitched above 1 kHz, we quickly realized that the bases need to output a low-frequency tone in order to be easily distinguished. Featuring all of these improvements, our new sets of bases are not only cheaper, but also safer, more portable, and more user-friendly.

<http://www.egr.msu.edu/classes/ece480/goodman/fall /group01>



N. Gingery  
*Electrical Egr*      B. Thomas  
*Electrical Egr*      Ki Yong Kwan  
*Electrical Egr*



Feng Yu  
*Electrical Egr*      S. Davis  
*Computer Eng*



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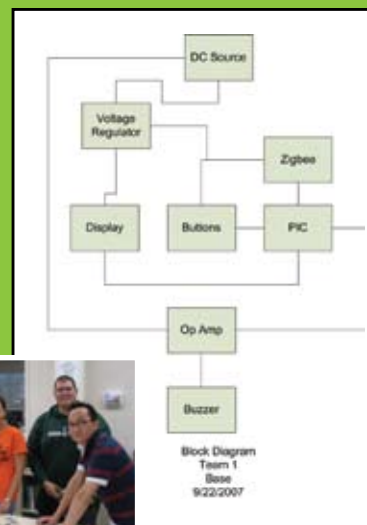
**Faculty Facilitator**  
Prof. Terence Brown

**Team Members and Non-technical Roles**  
Nathan Gingery  
*Manager*

Samuel Davis  
*Webmaster*  
Ki Yong Kwon  
*Documentation Prep*

Bryan Thomas  
*Presentation Prep*

Feng Yu  
*Lab Coordinator*



Mr. Blosser



Prof. Brown



# MSU MRPCD, CHRYSLER AND MIDLAND MICHIGAN ROTARY: PORTABLE AUDIO-VISUAL BOOK READER

**M**any persons with disabilities such as visual impairment or dyslexia experience reading disabilities and difficulties. These individuals often rely on computer programs such as Kurzweil 3000 or Read Please to read text aloud to them. These computer applications use a text-to-speech converter in order to speak the printed text aloud while highlighting the corresponding text in synchronization with the voice synthesizer.

The PC-based reading technology and licensing costs limit the usability of such software to a confined PC lab station, making the applications non-portable and inconvenient for everyday use. However, the rapid advancement of portable audio players, such as mp3 players, opens up the possibility for innovations to be made in the realm of book-reading applications.

In an effort to provide a more flexible reading experience for persons with reading disabilities, *Michigan State University's Resource Center for Persons with Disabilities* is sponsoring this project to make use of existing portable mp3 player technology to create a portable audio-visual book reader. The objective was to create a portable media player that will perform as a convenient delivery system for books already scanned and converted for speech by the Kurzweil 3000 software.

The final product will be an inexpensive, portable mp3 player with an integrated visual display, which will present the printed text in synchronization with mp3 audio. Parameters such as cost, size, and usability will be optimized while maintaining a low-power-consumption system with high reliability.

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



J. Cooper  
Electrical Egr

A. Hallman  
Electrical Egr

F. Okonkwo  
Electrical Egr



J. Yang  
Electrical Egr

J. Shim  
Computer Egr



CHRYSLER



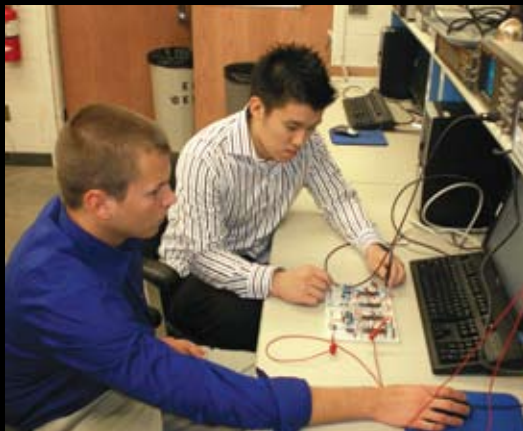
Resource Center for  
Persons with Disabilities



Mr. Blosser



Prof. Aviyente



### Team Members and Non-technical Roles

Jason Cooper  
Manager

Jaeseung Shim  
Lab Coordinator

Francis Okonkwo  
Webmaster

James Yang  
Documentation Preparation

Art Hallman  
Presentation Preparation

### Project Sponsors

MSU Resource Center for  
Persons with Disabilities,  
Chrysler and Midland  
Michigan Rotary

### Sponsor Representative

Mr. Steven Blosser

### Faculty Facilitator

Prof. Selin Aviyente

# MSU DEPARTMENT OF ZOOLOGY: TRACE GAS SAMPLE INTRODUCTION SYSTEM: PART OF THE FIELD-DEPLOYABLE ISOTOPE MASS SPECTROMETER

Our design team is building a Trace Gas Sample Introduction System (TGSIS) that will be used as a component of a larger system, the Field-deployable Isotope Mass Spectrometer (FIMS). Our system will filter a sample of air and pass on only CO<sub>2</sub> or N<sub>2</sub>O to another component of the FIMS that measures its isotopic quantity. The TGSIS will use an elaborate system of valves, pumps, chemical traps, and heating and cooling elements controlled by a computer to separate unwanted gases from the sample as it is passed through the system.

Our project team is working in conjunction with Dr. Nathaniel Ostrom of the *MSU Department of Zoology*. Under his direction, we are selecting each component of the system and interfacing them together with a computer and special circuitry. Heavy emphasis is being placed on the controlling computer unit and a rotary valve that directs the flow of gas. Upon completion, our system will play a role in a relatively lightweight and portable device that will measure isotope mass fluctuations in remote areas.

<http://www.egr.msu.edu/classes/ece480/goodman/fall/group03>



B. Levesque  
Electrical Egr



D. Ghiso  
Computer Egr



P. Strefling  
Mechanical Egr



J. Trzemzalski  
Electrical Egr



A. Brannan  
Mechanical Egr



D. Restauri  
Electrical Egr



M. Jennings  
Electrical Egr



D. Biegas  
Mechanical Egr



**Project Sponsor**  
*MSU Department of Zoology*

**Sponsor Representative**  
Dr. Nathaniel Ostrom

**Faculty Facilitator**  
Prof. Cevat Gokcek

## Team Members and Non-technical Roles

Ben Levesque  
*Manager*

Matt Jennings  
*Lab Coordinator*

Dave Biegas  
*Lab Coordinator*

Darren Ghiso  
*Webmaster*

Paul Strefling  
*Webmaster*

Joe Trzemzalski  
*Documentation Preparation*

Adam Brannan  
*Documentation Preparation*

Don Restauri  
*Presentation Preparation*



Dr. Ostrom



Prof. Gokcek

# CHRYSLER AND UNESCO: MONDIALOGO MEDICAL DIAGNOSIS SYSTEM

Our design team will refine the *Mondialogo* remote medical diagnostic system initially created by an ECE 480 design team in spring, 2007. The device is designed to provide medical screening at no cost to patients by providing accurate, safe, and understandable measurements with real-time results, without the need for highly trained medical personnel to perform the screening.

The team includes partners from HuaZhong University of Science and Technology (HUST, Wuhan, China), a biomedical engineer from the University of Bologna (Italy), and has expanded further to include medical students from MSU's College of Human Medicine. Together, our goals for the project are to enhance the following modules implemented last semester:

- Blood pressure measurement – MSU group
- Temperature measurement – MSU group
- Glucose measurement – MSU and Bologna groups
- Electrocardiogram (ECG) – HUST group
- Oxygen saturation measurement – HUST and Bologna groups
- Wireless infusion bottle warning system – HUST group

With the assistance of the medical team, we aim to increase the accuracy of the modules as well as improve interpretation of the results.

The focus this semester is implementing a fully functional, picture-based GUI along with moving from the ARM microprocessor embedded system to the more available X86 architecture. Our greatest challenge still remains in the integration of the individual modules with the central GUI.

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



R. Badon  
Electrical Egr

M. Barnes  
Electrical Egr

T. Black  
Computer Egr

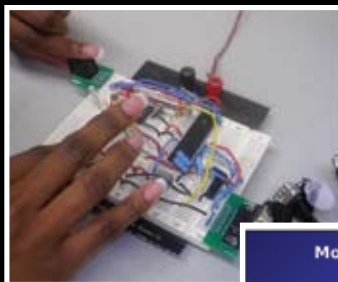


R. Bloodworth  
Computer Egr

R. Mackey  
Electrical Egr



Mr. Scheel



Temperature  
module on  
protoboard



Prof. Li

New GUI  
design  
for health  
monitor  
touchscreen  
interface



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Chrysler Automotive and  
UNESCO

**Sponsor Representative**  
Mr. Kevin Scheel

**Faculty Facilitator**  
Prof. TongTong Li

**Team Members and  
Non-technical Roles**  
Robyn Badon  
Manager

Terrell Black  
Webmaster

Ryan Bloodworth  
Documentation Prep

Robyn Mackey  
Presentation Prep

Michael Barnes  
Lab Coordinator



# NSF/WIMS ERC: WIRELESS RFID READER/WRITER FOR WIMS

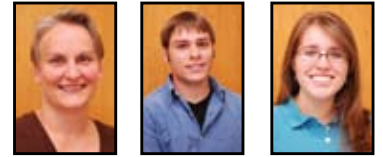
**R** RFID (Radio Frequency IDentification) is fast becoming a technology common to many aspects of daily life. From credit card purchases to large-scale inventory tracking systems, RFID is being incorporated into a wide array of industries. *The Center for Wireless Integrated Micro-Systems (WIMS)*, as part of its National Science Foundation-sponsored outreach activities, develops educational programs for K-12 students that highlight technologies such as RFID.

WIMS teaches students about RFID, and how it is used for inventory tracking purposes, by demonstrating it on a small scale with their tabletop factory setup and miniature roving robot. However, their current model is tethered to the controlling PC by a USB cable.

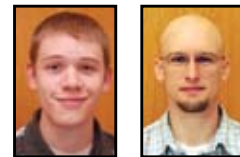
Our team's goal was to develop a new, wirelessly controlled RFID reader/writer module for use by the WIMS education program. The cost of commercially available devices is prohibitive for the program, and wirelessly controlled devices do not currently exist.

It is our hope that this project will demonstrate the viability of bringing interactive, wirelessly controlled RFID robotic devices into the manufacturing marketplace of the future, while providing a stimulating new module to excite students about RFID.

<http://www.egr.msu.edu/classes/ece480/goodman/fall/group05>



J. Early-Meehan Electrical Egr R. Ficano Electrical Egr J. Ash Electrical Egr



B. Thomas Computer Egr B. Brown Computer Egr



**Project Sponsor**  
**NSF/WIMS ERC**  
*(Center for Wireless Integrated Microsystems Engineering Research Center)*

**Sponsor Representative**  
 Dr. Dean Aslam

**Faculty Facilitator**  
 Prof. Nihar Mahapatra

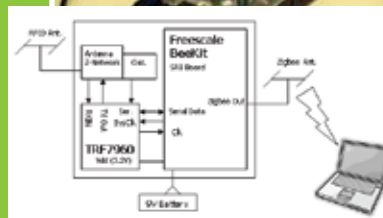
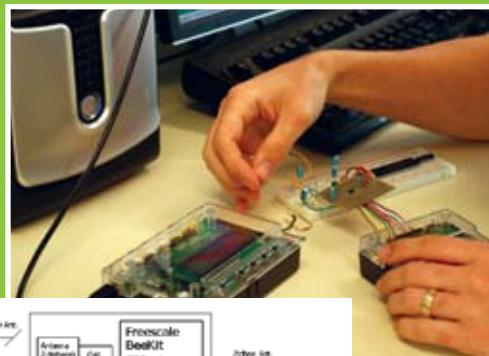
**Team Members and Non-technical Roles**  
 Julianne Early-Meehan  
*Manager*

Benjamin Brown  
*Lab Coordinator*

Jennifer Ash  
*Webmaster*

Brian Thomas  
*Documentation Preparation*

Robert Ficano  
*Presentation Preparation*



Dr. Aslam



Prof. Mahapatra

# NSF/WIMS ERC: OBSTACLE-AVOIDING WALL-CLIMBING ROBOT

In 2000, the University of Michigan, Michigan State University, and Michigan Technological University joined together to form the *Center for Wireless Integrated MicroSystems* (WIMS). This partnership combines Michigan's programs in sensors and microsystems with Michigan State's leadership in materials and Michigan Tech's expertise in packaging, micromilling, and hot embossing. With funding from the National Science Foundation (NSF) and the State of Michigan, WIMS is merging micropower circuits, wireless interfaces, biomedical and environmental sensors and subsystems, and advanced packaging to create microsystems that will have a pervasive impact on society.

WIMS has an existing wall-climbing robot that uses two motors and Smart Robotic Feet, which use powered suction, to walk on surfaces at angles up to approximately 70°. This robot is used for demonstrations to K-12 schools to promote science and engineering. Our objective is to create a new robot that can climb at angles of 90° as well as adding sensors to avoid obstacles. Our design will use two tracks, one horizontal and one vertical, for movement and two Smart Robotic Feet to provide the powered suction. Ultrasonic sensors will be implemented to allow the robot to detect and avoid obstacles. This will be an inexpensive, rugged, and reliable design that will be a great tool for generating interest in science and engineering for K-12 kids.

For more information on the obstacle-avoiding wall-climbing robot, please visit our website at:

<http://www.egr.msu.edu/classes/ece480/goodman/fall/group06/>



T. Furtwangler  
Computer Eng

D. Guyon  
Electrical Eng

P. T. Nuss  
Electrical Eng



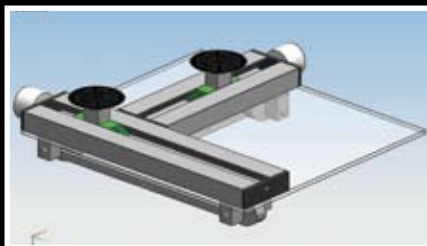
R. Wahula  
Mechanical Eng

T. Young  
Electrical Eng

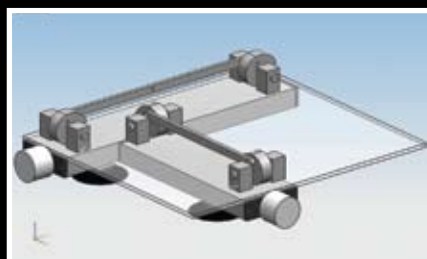
C. Zsenyuk  
Electrical Eng



Dr. Aslam



Prof. Khalil



**Project Sponsor**  
NSF/WIMS ERC  
(Wireless Integrated  
Microsystems Engineering  
Research Center)

Chris Zsenyuk  
Documentation Prep

**Sponsor  
Representative**  
Dr. Dean Aslam

Taylor Young  
Presentation Prep

**Faculty Facilitator**  
Prof. Hassan Khalil

Daniel Guyon  
Lab Coordinator

**Team Members and  
Non-technical Roles**  
Paul Nuss  
Manager

Ryan Wahula  
Lab Coordinator

Tyler Furtwangler  
Webmaster



# LEAR CORPORATION: MOTOR AND GEARING SELECTION PROGRAM

As the automotive industry has progressed, the comfort of the customer has become an important aspect of vehicle design. Motorized seat control in vehicles has gone from a luxury to necessity in the market. The front seats of a vehicle may incorporate up to seven motors in each seat, making it possible to adjust lumbar support, pitch, and the forward and backward motion of the seat.

To make it possible to fit seven motors in such a confined space and achieve maximum performance, vehicle manufacturers must choose motors that are both small and sufficiently powerful. With this in mind, *Lear Corporation* has requested our team to design a software program which calculates and chooses appropriate motor parameters.

In a motorized seat system, the motors are typically geared. Therefore, the combination of motor and gearing must be specified as a unit. *Lear* must be provided an interface to define all the required inputs to allow computation and analysis of this electromechanical system.

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



G. Antos  
Computer Egr



R. Olsztyn  
Electrical Egr



S. Pardee  
Electrical Egr



J. Seitz  
Electrical Egr



M. Umar  
Electrical Egr



**Project Sponsor**  
*Lear Corporation*

**Sponsor Representatives**

Mr. Winston Maue  
Mr. John Nathan

**Faculty Facilitator**  
Prof. Elias Strangas

**Team Members and Non-technical Roles**

Robert Olsztyn  
*Manager*

Muhammad Umar  
*Webmaster*

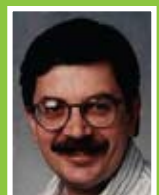
Geoffrey Antos  
*Documentation Prep*

Justin Seitz  
*Presentation Prep*

Sarah Pardee  
*Lab Coordinator*



Mr. Maue



Prof. Strangas

## LEAR CORPORATION: ADVANCEMENT OF DESK CHAIR TECHNOLOGIES FOR CHILDREN WITH CEREBRAL PALSY

**L**ear Corporation was founded in 1917 as American Metal Products in Detroit, Michigan, and is now one of the largest suppliers for automotive interiors and electrical systems in the world. The company went public in 1994 and is now headquartered in Southfield, Michigan. A major aspect of Lear's business involves designing, manufacturing, and supplying of seating systems.

Cerebral Palsy is a non-degenerative, neurological disorder that occurs either before, during or shortly after birth. The disorder affects muscle movement and coordination making it difficult to perform even the simplest of body motions.

Two students with Cerebral Palsy at Henry North Elementary School in Lansing, Michigan were studied to gain an insight on how their disorder affects their ability to seat themselves in a normal school desk chair. Their entire seating motions were captured to better understand the needs of a new chair.

Our primary student, Zach, has difficulty positioning his desk chair with a desk. Cerebral Palsy has hindered the use of his leg muscles forcing him to heavily rely on his upper body strength. Essentially, he needs a teacher to push him into and out of a school desk every day.

The goal of this project was to improve upon an existing desk chair for Zack and allow him to gain more independence in the classroom. Spatial constraints, weight, manufacturability, and safety were the main aspects of improvement. With these enhancements incorporated into our design Zach and other similar students will be able to independently seat themselves in a classroom.

.....Lear Corporation Student Design Team



Prof. Shaw

Lear Corporation is interested in facilitating a higher level of independence for students with physical disabilities by integrating special features and mechanisms into "standard" classroom furniture, making it more ergonomically usable by the students. This in turn contributes towards the students being able to achieve a higher level of academic success.

—Mark R. Keyser, Sr. Project Engineer

### Project Sponsor

**Lear Corporation**  
Southfield, Michigan

### Professional Advisors

Mr. Mark R. Keyser  
Mr. Winston Maue  
Mr. John Nathan

### Faculty Advisor

Prof. Steven Shaw

### Team Members and Home Towns

Michael Balck  
Grand Rapids, Michigan

Thomas Kret  
Trenton, Michigan

Joseph Obeidi  
Farmington Hills, Michigan

Anthony Piro  
Brighton Twp., Michigan

# THANKS TO NORFOLK SOUTHERN



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

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



*The Future of Transportation*



# thank YOU

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We thank the following companies for their generous support of the Department of Computer Science and Engineering and our senior capstone course lab:

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## LAKE ERIE ROOM SCHEDULE: CSE 498 COMPUTER SCIENCE AND ENGINEERING DESIGN PROJECTS

### PRESENTATION SCHEDULE – LAKE ERIE ROOM

Prof. Wayne Dyksen

Time	Company	Company Contact(s)	Project Title
8:00 Lake Erie CSE 498	Auto-Owners	R. Buchanan T. Fohey D. Pohl	Vendor Management System
8:25 Lake Erie CSE 498	Ford	A. Haas M. Vol M. Whitaker	Safety Index: Automotive Warning System
8:50 Lake Erie CSE 498	IBM	J. Effle N. Fontenot N. Nayar	Processor Folding for Linux on Power
9:15 Lake Erie CSE 498	Motorola	K. VanderBaan	Management Console for the Agent Framework
9:40 Lake Erie CSE 498	Sircon	C. Heathman B. Keller B. Niemiec J. Robb J. Zook	GUI Configuration Tool for Interviews
10:05 Lake Erie CSE 498	TechSmith	D. Craven T. Lambert R. Schott	Rich Media Collaboration

# AUTO-OWNERS INSURANCE COMPANY VENDOR MANAGEMENT SYSTEM

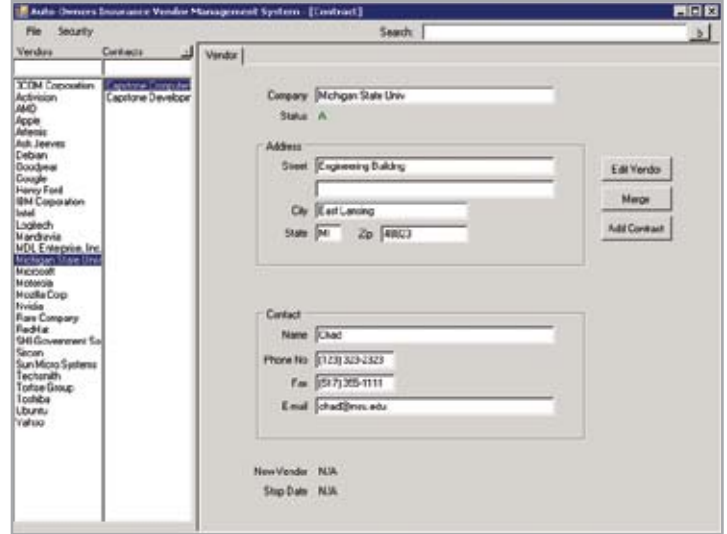
The Vendor Management System looks to maintain all 3rd party contracts that *Auto-Owners* currently holds. All contracts from Microsoft for their Office Suite product to IBM for a contractor will be held in our system. The program will be a virtual filing cabinet for information concerning contracts.

The difference between our system and a filing cabinet is that it will be accessible to many people at once, as well as notify the management about expiring contracts. This electronic solution will aid in facilitating important business decisions based around contracts.

The business impact that our project delivers is possible savings of thousands of dollars to *Auto-Owners*. By addressing expiring contracts and bringing attention to them we are aiding in a critical business process.

All of the systems information will be securely stored in a database interacting with each client application. There will be a login system as shown on the right which will ensure only authorized access to the application.

We have built our application to be as extendable as possible. By leveraging the C#.NET programming language we have created a program that will be easily maintainable. As well as using a Data-Access Layer we have created intuitive code for accessing critical data from our SQL2005 database.



## Auto-Owners Insurance Michigan State University

### Corporate Sponsors

Robert Buchanan  
Lansing, Michigan

Tim Fohey  
Lansing, Michigan

Doug Pohl  
Lansing, Michigan

### Team Members (left to right)

Anthony Ehret  
Okemos, Michigan

Chad Harter  
Holland, Michigan

Joe Bradford  
Eaton Rapids, Michigan

Chung-Hua Tsai  
Chiayi, Taiwan





# FORD MOTOR COMPANY

## SAFETY INDEX: AUTOMOTIVE WARNING SYSTEM

How could the internet make your car safer? Soon enough, every car will have internet access. Using the vast amount of data available from the various safety systems within a vehicle, the *MSU / Ford Research Project—SafetyNET*—aims to leverage the inter-connectedness afforded by the internet to help make the roads both safer and more enjoyable.

Utilizing data from multiple systems within a vehicle (from the activation of the Antilock Brake or Airbag Systems, to the simple act of turning on windshield wipers) SafetyNET constantly analyzes vehicle events in an attempt to determine the activities the driver is currently experiencing.

In doing so, when the system discovers an alert that would be important for other drivers to be aware of, the data is transmitted to a server. The server reinterprets the information with the data from other drivers in the area, and if appropriate, will store and distribute the alert to other drivers.

Within the vehicle, a touch screen based interface displays a map (similar to a navigation system) with all of the alerts that are in the area. Using audio and visual indicators based on driver preferences, alerts inform the driver of numerous events that could impact them; lane closures, car accidents, obstacles in the road, ice and rain, or even heavy traffic!

By sharing the data that is being gathered within the many safety systems within your *Ford* vehicle, you can arrive at your destination safer and faster than ever before. With the power of the internet SafetyNET makes all of this possible.



### Michigan State University

Team Members  
(left to right)

George Hoffman  
*Chicago, Illinois*

Rayshawn Holbrook  
*Flint, Michigan*

Jon Labaj  
*Macomb, Michigan*

Chris Spagnuolo  
*Okemos, Michigan*

### Ford Motor Company

Corporate Sponsors

Adam Haas  
*Hiroshima, Japan*

Michael Volk  
*Dearborn, Michigan*

Matthew Whitaker  
*Dearborn, Michigan*



# IBM

## PROCESSOR FOLDING FOR LINUX ON POWER

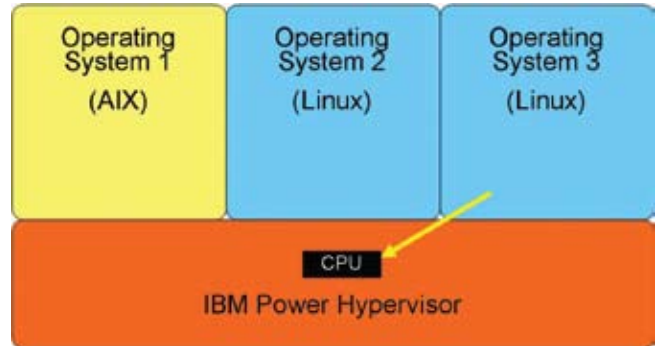
A high-end *IBM* server has enough power to download all of the music in the iTunes catalog in 60 seconds. Performance like this is only achieved with the careful tuning of both the hardware and software of the computer.

*IBM's* Power Hypervisor software allows multiple operating systems to run simultaneously on a server. This is difficult because it requires sharing the system hardware among all of the installed operating systems.

To take advantage of the hypervisor, *IBM* has built many features into the operating systems that utilize it. If a system has multiple processors, the Power Hypervisor can assign one or more processors to an operating system. If an operating system is not using one of its processors, it can release the processor to the Power Hypervisor so it can be used by the other operating systems on the machine. This process currently only happens when the processor is not being used.

Consider for a moment what would happen if an operating system with three processors allocated to it uses only 20% of each processor. Much of the processing power would be wasted. A new feature called processor folding could help reduce this waste. This feature would move the processes running on one of the processors onto the remaining two then give the empty processor back to the Power Hypervisor.

Processor folding is a feature that increases server value by simply making better use of the processors. It is this problem that was given to us to solve.



### IBM

#### Corporate Sponsors

Jim Effle  
Rochester, Minnesota

Nathan Fontenot  
Austin, Texas

Naresh Nayar  
Rochester, Minnesota

### Michigan State University

#### Team Members (left to right)

Josh Detwiler  
Holt, Michigan

Mark Bernum  
Port Huron, Michigan

Ian De Silva  
Tulsa, Oklahoma



# MOTOROLA

## MANAGEMENT CONSOLE FOR THE AGENT FRAMEWORK

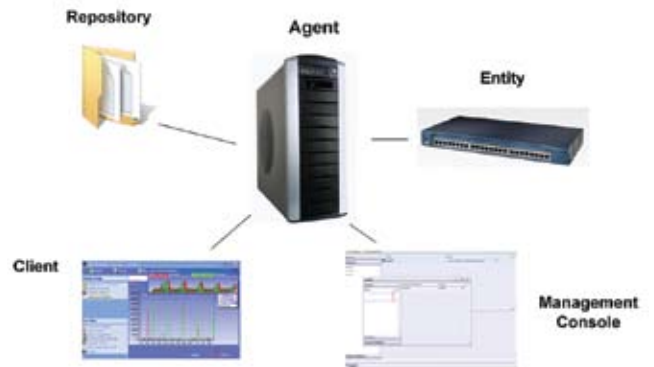
**M**otorola's Agent Framework exists to remotely manage network entities (e.g., a router, or an access point), allowing management of a network without having to become an expert in each entity's configuration language. However, managing components of this framework has now become cumbersome. In order to ease management of the framework, components need to be managed remotely. The solution for this problem involves an AJAX, web based console that interacts remotely with components generated by the framework.

Agents exist to receive data from and reprogram a network entity. Since different entities provide and use different data formats, the agent will translate the data into a common format and send the data to a client application, and vice versa.

Repositories exist to allow agents to be extended, enabling an agent to interact with an entity using a new data format. When a new component is developed, the component is uploaded to a repository so it can be downloaded and installed by an agent.

The management console is an AJAX, web-based interface. By using AJAX technology, the console provides the look and feel of a desktop application within a web browser.

The console manages agents and repositories that exist at known locations. The console is able to query, add and remove components on an agent, configuring the agent to communicate with network entities and client applications. Additionally, the console is able to upload a new component to a repository, and request the agent to download the new component.



**MOTOROLA**



### Michigan State University

Team Members  
(left to right)

Calvin Pinsuwan  
*Oak Park, Michigan*

David Dylegowski  
*Livonia, Michigan*

David Robishaw  
*Freeland, Michigan*

Drew Breider  
*Ann Arbor, Michigan*

### Motorola

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Kabe VanderBaan  
*Schaumburg, Illinois*



# SIRCON

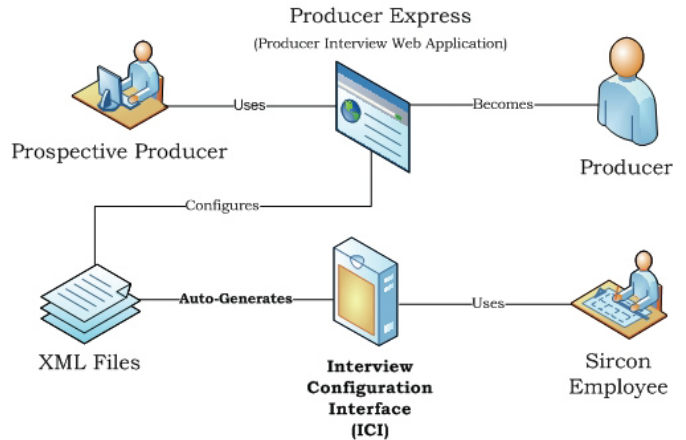
## GUI CONFIGURATION TOOL FOR INTERVIEWS

**S**ircon Corporation is one of the leading software providers to the insurance industry. Many insurance companies use software provided by Sircon to streamline their processes. Specifically, for this project we concentrated on the interview process that is used to hire new sales representatives.

Currently, insurance companies submit their paper interview forms to Sircon, at which point a trained analyst creates a series of electronic interview forms. This allows insurance companies and their prospective new hires access to the interviews via the World Wide Web. The application that contains these insurance companies' interviews is called Producer Express™ (PX).

To save Sircon time and money, we have created 'Interview Configuration Interface' (ICI), a tool that makes the process of creating an online interview much easier. Instead of "hand-coding" an interview for each new customer, ICI provides a user-friendly graphical interface. This reduces the training necessary before a Sircon analyst can begin to set up an interview, and reduces the time required to set up an interview once training is complete.

This graphical application was written using Java version 1.6 and will run under the Windows XP operating system. While a graphical interview is created, ICI will automatically generate and validate the Extensible Markup Language (XML) files required by PX to describe an insurance company's interview. ICI implements XML validation to ensure a seamless transition from design to production.



### Sircon

#### Corporate Sponsors

Colleen Heathman  
*Okemos, Michigan*

Bill Keller  
*Okemos, Michigan*

Brian Niemiec  
*Okemos, Michigan*

Jake Robb  
*Okemos, Michigan*

Josh Zook  
*Okemos, Michigan*

### Michigan State University

#### Team Members (left to right)

Mille Gracik  
*East Tawas, Michigan*

Nicholas VanHowe  
*Shelby Twp, Michigan*

Ben Split  
*Grand Rapids, Michigan*

Ryan Abbott  
*Holt, Michigan*



# TECHSMITH CORPORATION

## RICH MEDIA COLLABORATION

**I**nterception! A devastating turnover has left the announcers with the responsibility of explaining the replay to the audience. With the ability to draw on the screen, the announcers are able to effectively communicate with the viewers what was happening on the field.

Imagine how useful this interaction could be in other situations. A professor might post a lecture video online allowing students to comment, draw, and “tag” directly on the video with any questions or concerns they might have. This type of media interaction is referred to as “deep-tagging,” in which viewers can comment or tag a segment of the video, and even draw on the video at any point in time.

We believe this sort of application to be useful in situations involving instruction or formal presentation and have included a screen recorder to assist users in creating and uploading their own content to the website.

Our player allows for all the basic features of a media player; however, the true power of the application lies in its deep-tagging ability. Using the tagging tools provided, anyone can easily apply text or draw by using predefined shapes or the free hand tool. Once a tag is made, the player saves it to an index alongside the player window. From that point on, the video will play with the newly added content for all to see.

The player utilizes Silverlight, Microsoft’s runtime for rich Internet applications, providing us with the necessary animation, vector graphics, and video playback capabilities.



### Features

- The ability to draw on the video and add text comments directly on or off the video
- The ability to tag at any time in the video
- The ability to skip directly to a tagged time
- The ability to reply to any tag
- A screen recorder to assist users in creating and uploading their own content



### Michigan State University

Team Members  
(left to right)

Chris Harter  
*Holland, Michigan*

Tom Lavoy  
*Dansville, Michigan*

Jason Conley  
*Detroit, Michigan*

Brandon Turner  
*Grand Blanc, Michigan*

### TechSmith Corporation

Corporate Sponsors

Dean Craven  
*Okemos, Michigan*

Tony Lambert  
*Okemos, Michigan*

Randy Schott  
*Okemos, Michigan*



# Tower

8:00 –Noon  
Fourth Floor  
Tower Room

## MECHANICAL ENGINEERING DESIGN PROJECTS

### PRESENTATION SCHEDULE – Tower Room

Course Coordinator: Prof. Craig Somerton

Faculty Advisors: Professors Jaber, Koochesfahani, Kwon, Loos, Naguib, Pence, Priezjev, Wichman and Zhu

Time	Sponsor(s)	Project Contact(s)	Faculty Advisor	Project Title
8:00 Tower Room ME 481	O.G. Services	G. Shedrick	A. Loos	O.G. Services: Value Cap
8:25 Tower Room ME 481	Civil Infrastructure Engineering Lab	R. Harichandran G. Zhang	P. Kwon	Mobile Impact Device for Bridge Inspections
8:50 Tower Room ME 481	General Motors	A. Butlin	I. Wichman	Best Execution of a Low Mass Cost-effective Horn
9:15 Tower Room ME 481	General Motors	A. Butlin	A. Naguib	Engineering and Design of Increased Fuel Efficient Radiator Fan
10:00 Tower Room ME 481	DeVilbiss Automotive Refinishing	M. Charpie	N. Priezjev	Intrinsically Safe Paint Dryer Device
10:25 Tower Room ME 481	Lansing Board of Water and Light	I. Armock P. Thelen	M. Kocchesfahani	Coal Car Unloading for Ergonomic Improvements
10:50 Tower Room ME 481	Dematic	D. Schuitema	T. Pence	Ergonomic Trailer Loader Extension
11:15 Tower Room ME 481	Consumers Energy	K. Sauer	G. Zhu	GPS Third Party Application
11:40 Tower Room ME 481	Cummins & Barnard	S. Herrygers	F. Jaber	Mercury Reduction Alternatives for the Alcoa Warwick Power Plant

## O.G. SERVICES: VALUE CAP

**O**.G. Services, based out of Saginaw, Michigan was created by Glenn Shedrick. He is an entrepreneur with an MBA and a background in marketing. He created the company to pursue his idea of the Value Cap.

The main focus of the O.G. Services Value Cap project is to develop a product which gives the consumer the ability to utilize the remains of a product that ordinary pump dispensers leave behind. Once an adequate solution to the problem is found and a final product is created, the focus for O.G. Services will be to begin marketing the Value Cap through trade shows and retail outlets. The ultimate goal is to market the product to major corporations that currently utilize pump dispensers on their products. On a large scale, the scope of the project is to manufacture a low cost, high quality product to consumers in the United States with the goal of providing value to the customer.

The team has been directed to design a cap that receives a range of lotion bottles and fully dispenses the remaining product left in the bottle. The prototype will be developed by creating 3-D computer models of the designs. These computer models will then be used in a rapid prototyping process to create a functional prototype.

...The O.G. Services Student Design Team



**Project Sponsor**  
**O.G. Services**  
 Saginaw, Michigan

**Professional Advisor**  
 Mr. Glen Shedrick

**Faculty Advisor**  
 Prof. Alfred Loos

**Team Members  
 and Home Towns**  
 Joshua Ewing  
 Dearborn, Michigan

Andrew Kosinski  
 Sterling Heights, Michigan

Jonathon Ostroski  
 Rochester Hills, Michigan

David Ruddock  
 Okemos, Michigan

The goal for this product is to provide consumers an immediate cost savings by using a unique cap design. The distinctive cap will provide greater efficiencies for consumers that use bottles with a pump dispenser. Simply stated, the mission is to create a high quality low cost retrofit cap. O.G. Services will seek to create business alliances throughout the distribution supply chain to ensure a successful launch of the value cap.

Glenn Shedrick  
 O.G. Services



Mr. Shedrick



Prof. Loos

## MSU CIVIL INFRASTRUCTURE LAB: MOBILE IMPACT DEVICE FOR BRIDGE INSPECTIONS

The *Civil Infrastructure Engineering Lab* is located within the Department of Civil and Environmental Engineering at Michigan State University. The *Civil Infrastructure Engineering Lab* has a leadership role within the research departments of five companies, one being the Michigan Department of Transportation.

Bridges suffer from delamination, fatigue, and cracks; and there is no unique method of detecting these flaws. One of many methods is to have a trained employee listen carefully as chains drag across the bridge. If the sound is unusual, the location is marked and more accurately checked by tapping with a steel rod and listening to changes in sound. This method is time consuming and requires specially trained personnel.

The Michigan Department of Transportation has requested that the *Civil Infrastructure Engineering Lab* develop both a method and a mobile impact device to continuously perform a nondestructive test to detect potential fatigue that occurs in bridges. The goal of this device was to provide a consistent sound upon impact, so that in the future, non-experienced employees can easily determine delamination in roadbeds.

This project required multiple disciplines of engineering; the mechanical engineering aspect of this undertaking was to develop a cart to house the device, the recording and analysis instruments and provide a shield from internal and ambient noises. The device had to be light enough for two people to remove from a vehicle, yet sturdy enough to be used throughout the day.

...*The Civil & Environmental Engineering Student Design Team*



Dr. Harichandran

The prototype impact device that is built will be used by the Michigan Department of Transportation for detecting delamination in concrete bridge decks. If the device performs well, then additional devices replicating the prototype are likely to be built for use around the state. The device would yield a significant improvement in both the accuracy of detection and in inspection time over current manual methods.



Prof. Kwon

Dr. Ronald S. Harichandran  
Professor and Chairperson  
*Civil & Environmental Engineering*

### Team Members and Home Towns

Michael Fong  
Boston, Massachusetts

Arjang Gounelli  
Anaheim Hills, California

Benjamin Greyerbiehl  
East Lansing, Michigan

Sylwia Poplawska  
Warsaw, Poland

### Project Sponsor

*Civil Infrastructure Engineering Lab*,  
Department of Civil and Environmental Engineering  
East Lansing, Michigan

### Professional Advisors

Dr. Ronald Harichandran  
Mr. Gang Zhang

### Faculty Advisor

Prof. Patrick Kwon



# GENERAL MOTORS: BEST EXECUTION OF A LOW MASS, COST-EFFECTIVE HORN

A primary focus of the automobile industry in recent years has been promoting fuel efficiency in production vehicles. *General Motors* has made it a company-wide goal to take a leadership initiative to manufacture more efficient “green” cars. It has long been known that perhaps the easiest means to achieving this goal is to make cars lighter. In recent years *GM* has produced a concept Chevrolet Suburban that was 750 lbs lighter than the production model while preserving all of its functionality. Many aspects of that concept were incorporated in future production models. Since then, a “concept learning vehicle” has been proposed to cut the weight of compact cars by 500 lbs. To achieve this goal, each individual system of the car must be examined to improve mass and total efficiency.

The purpose of this design project is to produce a low mass, cost-effective horn system. Though a vehicle horn may seem small, it exists in each automobile manufactured today. Thus any improvement could make a large impact throughout the *General Motors* product line. At the same time, there are many specifications and government regulations that must be considered in order to manufacture a horn. These include frequency, tone quality and decibel level. We intend to develop a horn for a test vehicle that meets all performance guidelines while reducing cost, mass, and energy use.

...*The General Motors Student Design Team*



**Project Sponsor**  
**General Motors Corporation**  
 Warren, Michigan

**Professional Advisor**  
 Mr. Al Butlin

**Faculty Advisor**  
 Prof. Indrek Wichman

**Team Members and Home Towns**  
 Alex Grobbel  
 Rochester, MI

Mike McKimmy  
 Cement City, MI

Elliott Radcliffe  
 Okemos, MI

Elliot Tippmann  
 Coldwater, MI

To meet future energy and environmental needs, the automotive industry is striving to improve vehicle efficiency. The Low Mass Cost Effective Horn may seem like minor contributor for vehicle efficiency, but viewed from a high level vehicle perspective it could provide large benefits. It is also used on all vehicle product lines regardless of type, thus it will make a full product line impact enabling a more energy efficient product line.

-Al Butlin, *General Motors Corporation*



Mr. Butlin



Prof. Wichman

## GENERAL MOTORS: ENGINEERING AND DESIGN OF INCREASED FUEL EFFICIENT RADIATOR FAN

Founded in 1908, *General Motors Corporation* is the world's largest automotive producer. With the world headquarters located in Detroit, Michigan, *GM* employs 284,000 workers around the world. They have been the global sales leader in their industry for 76 years. In 2006 alone, 9.1 million automotive vehicles were sold worldwide.

Recent environmental concerns have provided a strong push in automotive design to produce more efficient vehicles. In order to combat the under-hood drag produced by the RAM air on the vehicle, the air flow through the radiator will be reduced. In introducing a reduced air flow into the Condenser Radiator Fan Module (CRFM), a new radiator fan/motor design is to be engineered to accommodate engine cooling while increasing fuel efficiency.

By increasing the efficiency of the radiator fan/motor and reducing the air flow through the under-hood of the vehicle, a more fuel efficient vehicle will be manufactured.

To complete this task, an analytical model of a radiator fan/motor system will be created taking into consideration: fan blade design, diameter, RPM, power input, fan efficiency, flow rate, and fuel efficiency of the vehicle.

...*The General Motors Student Design Team*



Mr. Butlin

To meet future energy and environmental needs, the automotive industry is striving to improve vehicle efficiency. The Low Drag CRFM System would support the need to decrease lost energy and improve aero and cooling efficiency. This system is applicable to all vehicle product lines regardless of vehicle and powertrain type, thus it can make a full product line impact enabling a more energy efficient product line.

-Albert Butlin, *General Motors Corporation*



Prof. Naguib

### Team Members and Home Towns

Scott Doyle  
Rochester, Michigan

Jeremy Horgan  
Livonia, Michigan

Matt Nagle  
Livonia, Michigan

**Project Sponsor**  
*General Motors Corporation*  
Warren, Michigan

**Professional Advisor**  
Mr. Albert Butlin

**Faculty Advisor**  
Prof. Ahmed Naguib

# DEVILBISS AUTOMOTIVE REFINISHING: INTRINSICALLY SAFE PAINT DRYER DEVICE

**D**eVILBISS is a sub-business of Illinois Tool Works Inc. that specializes in automotive refinishing products such as spray guns, pressure cups and tanks, air control systems, and safety equipment. Recently, regulatory agencies in Canada and California passed guidelines limiting the amount of volatile organic compounds that basecoat paints used in automotive refinishing can contain. New waterborne basecoats have been implemented to meet these new requirements.

These basecoats, while new to North America, have been utilized for several years in Europe. Water is the primary solvent, which requires additional drying time. To speed up the drying process, DeVILBISS has introduced air guns which force air over the drying surface to increase the rate of evaporation. The current design of these paint-drying guns, however, consumes too much compressed air and strips this power source from the rest of the shop tools.

In order to reduce these consumption levels, it has been recommended that a new design be explored which must provide at least the same amount of airflow at the same velocity, while using a minimum of 50% less compressed air than the current design. A new and more efficient air gun will help position DeVILBISS as a leader in an emerging market for more environmentally friendly painting solutions. This market is expected to grow rapidly over the next few years, as more stringent regulations are expected to be implemented across the country.

...The DeVILBISS Student Design Team



**Project Sponsor**  
*DeVILBISS Automotive Refinishing*  
Maumee, Ohio

**Professional Advisor**  
Mr. Mark Charpie

**Faculty Advisor**  
Prof. Nikolai Priezjev

**Team Members and Home Towns**  
John Benghauser  
Lansing, Michigan

Matthew Hirschfield  
Troy, Michigan

Sean Noonan  
Naperville, Illinois

Alejandro Recio-Sada  
Monterrey, Mexico

The introduction of a new waterborne drying device, that would not starve the shops of compressed air, would obsolete current technology and help promote DeVilbiss as the market leader in drying waterborne coating materials.

Mark E. Charpie  
Innovation & Regulatory Affairs Manager  
*DeVILBISS Automotive Refinishing*



Mr. Charpie



Prof. Priezjev

# LANSING BOARD OF WATER AND LIGHT: COAL CAR UNLOADING FOR ERGONOMIC IMPROVEMENTS

**L**ansing Board of Water and Light (BWL) is a locally- based utility company for the Lansing area. This company was first started in 1885 as a result of a voter approved \$100,000 bond for water works. The BWL supplies over 54,000 customers their water, and after building two power plants, now supplies 98,000 customers with over 500 Megawatts of electricity.

During the cold months, water gets into the coal cars. This freezes the coal into large chunks. The frozen coal is difficult to move and break apart, which in turn causes problems. These include blocking the unloading doors on the railcar, blocking the grates, and derailing the cars. Unfortunately, the workers only have simple sledgehammers and bars to break apart these coal masses. This process is strenuous on their bodies. There needs to be a better arrangement to keep the coal from freezing, thawing the coal, and/or breaking up the chunks.

This project will focus on mechanics of the body and new tool design to increase mechanical advantage and reduce employee fatigue. The new course of action must reduce stress on the employees' upper bodies from impact forces while unplugging the grate and breaking the coal apart.

...The Lansing Board of Water and Light Student Design Team



Ms. Armock



Mr. Thelen

This project will use bright young minds to bring a new approach to design and type of tools used by Coal Handlers at Eckert Station. Creating a new design will enable the Coal Handlers to have less fatigue and nagging injuries. In turn, lower demurrage will result on coal cars because these tools would improve coal handling efficiency.

The financial impact could be up to \$20,000 per year reduction to coal car demurrage. The cost of an injured coal handler who has to have surgery and recovery time is \$10,000 to \$40,000 depending on the injury.

Peter Thelen  
Director  
Industrial Health and Safety



Prof. Koochesfahani

## Team Members and Home Towns

Andrew Howard  
Canton, Michigan

Brian Pernick  
Commerce, Michigan

Sean Steffer  
Brighton, Michigan

Richard Utrup  
Newaygo, Michigan

**Project Sponsor**  
Lansing Board of  
Water and Light  
Lansing, Michigan

**Professional Advisors**  
Ms. Irene Armock  
Mr. Peter Thelen

**Faculty Advisor**  
Prof. Manoochehr  
Koochesfahani



## DEMATIC: ERGONOMIC TRAILER LOADER EXTENSION

**D***ematic Corporation*, located in Grand Rapids, Michigan, is the world's leading supplier of automated material handling systems for manufacturing, production, warehousing, and distribution. *Dematic's* corporate headquarters is located in Grand Rapids, Michigan; as is their Technology Center and primary manufacturing plant. *Dematic* provides complete resources for supply chain and material flow analysis, systems innovation and engineering, project management, controlled quality manufacturing, installation, and comprehensive life-cycle support.

Trailer loaders and extensions are the last pieces in a complex, high-tech distribution system. The process begins with pick stations where workers fill orders from racks along a powered conveyor. The powered conveyor moves the selected product to a sorter above the warehouse floor. The sorter electronically marks product location and directs the product to the corresponding trailer via a chute or decline conveyor. This is where the trailer loader receives the product and delivers it into the trailer, where trailer loader operators stack it for delivery.

This project focused on the design of a new extension piece to be used with two models of *Dematic* Trailer Loaders. *Dematic* offers a complete line of trailer loaders and extensions to assist in loading product into semi-trailers. The goal was to implement a new, more ergonomic trailer loader extension design that decreased operator stress and injury while maintaining productivity.

Completing this project required the quantification of design requirements and the proposal and analysis of multiple designs. It also required iterative redesign of the selected design based on stress analyses.

...*The DEMATIC Student Design Team*



**Project Sponsor**  
**Dematic Corporation**  
Grand Rapids, Michigan

**Professional Advisor**  
Mr. Dennis Schuitema

**Faculty Advisors**  
Prof. Thomas Pence

**Team Members  
and Home Towns**  
Lindsay Bockstiegel  
Cincinnati, Ohio

Keith Bury  
Port Huron, Michigan

Kyle Lehrmann  
Midland, Michigan

Michael O'Connell  
West Bloomfield, Michigan

This project will design equipment that will semi-automate loading of packages into a semi-trailer - an area of material handling that has traditionally been all manual. The design will provide significant ergonomic, operational, and competitive advantages, as well as address issues of the past, including durability, maintainability, operator abuse, and safety.

Dennis Schuitema  
Mechanical Products Development Manager  
*Dematic Corporation*



Mr. Schuitema



Prof. Pence

# CONSUMERS ENERGY: GPS THIRD PARTY APPLICATION

**C**onsumers Energy (CE) is one of the nation's largest combination utilities, providing natural gas and electricity to nearly 6.5 million of the state's 10 million residents in all 68 Lower Peninsula counties.

CE has recently implemented a system that uses a cellular modem to communicate GPS data from all of their vehicles to their facilities. That data is then available in the form of either live data or stored data. The stored data can be used to make reports indicating where vehicles have traveled, how fast they got there, how long they stopped, etc. CE acknowledged the benefits of having GPS on vehicles belonging to third party contractors. How the current hardware is packaged and deployed presented a problem for CE.

The Consumers Energy Student Design Team was faced with developing a GPS modem protective case that satisfies mobility demands while maintaining reliability when subject to unpredictable on-the-job abuse.

Ascertainment of the solution required a rigorous design validation process. Design solutions for the GPS modem protective case emanated from tests conducted to ensure water resistance, impact resistance, and thermal resistance.

...The Consumers Energy Student Design Team



Mr. Sauer

The employee's safety is enhanced by the dispatchers knowing where they are in case of an emergency. Managers are able to more effectively recognize where resources are and move them to areas as needed, thereby reducing operating costs and providing faster response to customer and system needs.

-Kip Sauer, Consumers Energy



Prof. Zhu

### Team Members and Home Towns

R. Dusty Henderson  
Galien, Michigan

Jay Richards  
East Lansing, Michigan

Ryan Taelman  
Traverse City, Michigan

Beth Volz  
Farmington Hills, Michigan

**Project Sponsor**  
Consumers Energy  
Jackson, Michigan

**Professional Advisor**  
Mr. Kip Sauer

**Faculty Advisor**  
Prof. George Zhu



# CUMMINS & BARNARD: MERCURY REDUCTION ALTERNATIVES FOR THE ALCOA WARRICK POWER PLANT

**C**ummins & Barnard Inc. is a full-service engineering consulting firm headquartered in Ann Arbor, Michigan. Cummins & Barnard was founded in 1932 with a focus on providing consulting as well as design services for thermal and electric generation and distribution to utility, institutional, industrial, and commercial clients. Cummins & Barnard presently maintains a strong focus on the power industry and continues to develop strong client engagements. Michigan State University has teamed up with Cummins & Barnard to support the analysis of mercury reduction solutions for the Alcoa Warrick Power Plant.

Alcoa is the world's leading producer and manager of primary aluminum, fabricated aluminum and alumina facilities, and is active in all aspects of the industry. Alcoa serves the aerospace, automotive, packaging, building and construction, commercial transportation, and industrial markets. This specific project is focused on the coal-fired power plant in Warrick, Indiana. This facility is one of the largest aluminum smelting and fabricating facilities in the world. Alcoa's Primary Metals and Rigid Packaging divisions are located at this facility, where aluminum sheet for beverage and food can ends and tabs are made along with other flat-rolled aluminum products.

The goal of this project was to develop a thorough technical analysis of the various mercury reduction technologies as they apply to the Alcoa Warrick plant configuration. This analysis is being done to propose the



optimal mercury reduction operations for the coal-fired Alcoa Warrick Power Plant. The Environmental Protection Agency (EPA) is in the process of passing stringent legislation which will mandate the amount of plant mercury emissions per year. The basis of this study will target the mercury content of the various coal types being burned, unit performance, economic assumptions, plant arrangements (i.e. component interface, spatial constraints, etc...), and waste utilization issues as they impact the installation and effectiveness of the available mercury reduction technologies.

The scope of this detailed study is focused on optimal mercury reduction and environmental enhancements, and is a confident solution proposed by the *Cummins & Barnard Student Design Team*.

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

**Project Sponsor**  
**Cummins & Barnard Inc.**  
 Ann Arbor, MI  
**Professional Advisor**  
 Mr. Steve Herrygers

**Faculty Advisor**  
 Prof. Farhad Jaber

**Team Members and Home Towns**  
 Evan DeTone  
 Oakland Township, Michigan

Ben Dreher  
 Niles, Michigan

Jordan Hauser  
 Antioch, Illinois

Scott Stieber  
 Grosse Pointe, Michigan

Alcoa is the world's leading producer and manager of primary aluminum, fabricated aluminum and alumina facilities, and is active in all major aspects of the industry. Cummins & Barnard is an engineering consulting firm located in Ann Arbor, Michigan who supports Alcoa with a variety of strategic consulting activities. MSU students will assist C&B in an actual environmental betterment assessment to identify, evaluate, and recommend a mercury removal technology which Alcoa could implement to achieve its environmental objectives.

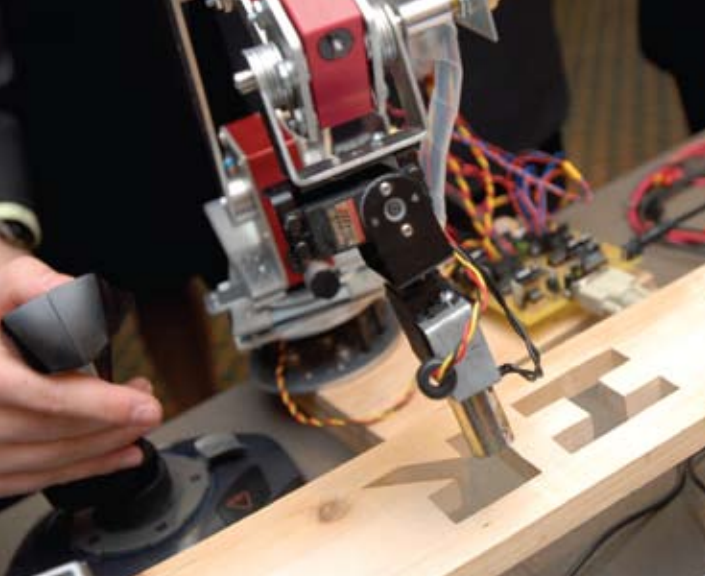
Steve Herrygers  
 Mechanical Engineer  
 Cummins & Barnard Inc.



Mr. Herrygers



Prof. Jaber





# Design Day Awards:

MICHIGAN STATE COLLEGE OF ENGINEERING

## Computer Science and Engineering Awards

CSE 498, Collaborative Design, is the senior capstone course for students majoring in computer science. Teams of students design, develop, and deliver a significant software system for corporate clients. The CSE capstone teams compete for four prestigious awards. On Design Day, the winners are selected by a panel of judges including CSE corporate partners and the department chairperson.



**CHRYSLER**

### Chrysler Praxis Award

One of the hallmarks of CSE 498 capstone projects is that of praxis, the process of putting theoretical knowledge into practice. Teams apply a wide variety of information technologies to produce solutions to complex problems in areas such as business, engineering, computing, and science.

The CSE capstone team who engineers the most technically challenging software system will be recognized with the Chrysler Praxis Award, which is sponsored by Chrysler LLC of Auburn Hills, Michigan.



### TechSmith Screencast Award

Each CSE 498 capstone team produces a video that describes and demonstrates their software product. Starting with a storyboard and a script, teams use Camtasia Studio 5 to synthesize screen recordings, video, audio and other multimedia to produce their project videos.

And the TechSmith Screencast Award goes to...the CSE capstone team with the best project video. The award is sponsored by the creators of Camtasia Studio, TechSmith of Okemos, Michigan.



### Auto-Owners Exposition Award

CS 498 capstone teams present their projects on Design Day in a variety of ways. Teams create and set up an exhibit where they demonstrate their software systems and answer questions from Design Day attendees. Each team will play their project videos and answer questions for a panel of judges. The CSE capstone team with the best overall Design Day performance will be honored with the Auto-Owners Exposition Award, which is sponsored by Auto-Owners Insurance Company of Lansing, Michigan.



### Crowe Sigma Award

The CSE 498 experience represents the capstone of the educational career of each computer science major. An intense semester of teamwork produces impressive deliverables that include a formal technical specification, software, documentation, user manuals, a video, a team web site, and Design Day participation. The resulting sum—the capstone experience—is much greater than the parts.

The capstone team that delivers the best overall capstone experience will be recognized with the Crowe Sigma Award, which is sponsored by Crowe Chizek and Company LLC, one of the nation's largest public accounting and consulting firms with twenty-two offices in nine states.

# Design Day Awards:

MICHIGAN STATE COLLEGE OF ENGINEERING

## Mechanical Engineering: Thomas Alva Edison Undergraduate Design Award

The Edison Scholars are recognized as the ME 481 Design Team that has produced the most outstanding project. A jury of experts from industry and academia evaluate the final reports, the posters, and the final oral presentations in determining the award winners. Teams operating under ME 481 that include members from other departments and colleges are also eligible for this award. The funding for this award is provided by the Shell Oil Company.



*l-r: Ratikant Behera, Sandip Suvedi, Shantanu Joshi, Basak Oguz*

### SPRING 2007 ME 481 EDISON UNDERGRADUATE DESIGN AWARD

#### First Place

*Shell Oil Children's Humanitarian Project: Desk Chair to Accommodate Special Needs Children*  
Ratikant Behera  
Shantanu Joshi  
Basak Oguz  
Sandip Suvedi

#### Second Place

*Shell Oil Children's Humanitarian Project: Adaptive Shower Chair*  
Cipto Joegiono  
Jennifer Langridge  
Jill Randall  
Nancy Sidrak

#### Third Place

*Stryker Corporation Braking System for a Hospial Bed*  
Nicholas Beechnau  
Aaron Cole  
Matthew Hays  
Nicholas Nwabueze  
Nancy Sidrak

## ME 481 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. The funding for this award is provided by the Shell Oil Company.

### SPRING 2007 ME 481 LEONARDO DAVINCI SCHOLARS



#### First Place

Patrick Grondin  
Jillian Joliat  
Matthew Langenderfer

#### Second Place

Michael Fong  
Ryan Wahula  
Taylor Young

#### Third Place

Evan Marks  
Eliott Radcliffe  
Daniel Raphael  
Elliot Tippmann

*l-r: Jillian Joliat, Patrick Grondin, Matthew Langenderfer*

## ME 481 Oral Presentation Award



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

### SPRING 2007 ME 481 ORAL PRESENTATIONS

*l-r: Megan Lawrence, Matt Rokosz, Dana LeMir, Stephanie Wong, Anita Solitro, Seth Grua (not pictured), Katie Slovan*

#### First Place

*Dow Chemical Hermetic Seal Model*  
Seth Grua  
Megan Lawrence  
Dana LeMire  
Matt Rokosz  
Katie Slovan  
Anita Solitro  
Stephanie Wong

#### Second Place

*Airmaster Fan Whole House Fan with Latent Heat Recovery*  
Andrew Gillett  
Chad Kleinow  
Chrystal Kozsey  
Andrew Kruk  
Kevin McKay  
Melissa Poirier  
Alyse Solomon

#### Third Place

*Behr America HVAC Noise Reduction*  
Bethany Danielski  
Andrew Siefert  
Matt Warner

# Design Day Awards:

MICHIGAN STATE COLLEGE OF ENGINEERING

## Mechanical Engineering: Spring 2007 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 Award. This team is recognized with a plaque designed and manufactured by Mr. Jon Thon's 7th grade technology class at Holt Junior High School.



### First Place

Michael Booth  
Kyle Koepf  
Hani Kobry  
John Woodruff

### Second Place

Chris Cafee  
Michael Cooper  
Brad Rutledge  
Scott Slingerland

### Third Place

Brandon Bouchard  
Justin Bradford  
Zachary Steffes  
Ryan Stull

*l-r:* Michael Booth, John Woodruff, Kyle Koepf, Hani Kobry

## Spring 2007 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. The award winners are determined by the course instructor based on team scoring in the competition.



### First Place

Mark Ehrenberger  
Seunghee Han  
Matt Ryerkerk  
Wayne Steward

### Second Place

Alexis Bauer  
Andrew Gillett  
Kacy King  
Sean Steffer

### Third Place

Scott Dosson  
Jason Flanigan  
Jacob Schulz  
Chi-Hong Yung

*l-r:* Wayne Steward, Seunghee Ha, Matt Ryerkerk, Mark Ehrenberger

## Spring 2007 ME 371 Mechanical Contraption Award

The best ME 371 project as determined by the faculty and students of the course receive the Mechanical Contraption Award.

*l-r:* Lauren Sharp, Richard Wahl, Shaheen Shidfar, Cody Priess, Ryan Rieck



### First Place

Cody Priess  
Ryan Rieck  
Lauren Sharp  
Shaheen Shidfar  
Richard Wahl

### Second Place

Brandon Bouchard  
Justin Bradford  
Zachary Steffes  
Ryan Stull

### Third Place

Brian Smith  
Adam Sneller  
Boon Yong

## Outstanding Poster Award: All Departments

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.

### SPRING 2007 CAPSTONE DESIGN DAY POSTER AWARD WINNERS



### First Place

*Behr America HVAC  
Noise Reduction*  
Bethany Danielski  
Andrew Siefert  
Matt Warner

### Second Place

*Assistive Actuation  
of Brass Instrument  
Valves*  
Raymond Gallagher  
Daniel Isaac  
Zachary Kaltz  
Matthew Ryerkerk

### Third Place

*MSU Intercollegiate  
Athletics MIA3  
Party Tank*  
Mark Ehrenberger  
Justin Ketterer  
Nandan Patel  
Stephen Patrick  
Matt Raetz  
Andrew Schaffer  
Wayne Steward  
Matt Warpinski

*l-r:* Andrew Siefert, Bethany Danielski, Matt Warner

# Design Day Awards:

MICHIGAN STATE COLLEGE OF ENGINEERING

## Electrical and Computer Engineering Prism VentureWorks Prize

The Prism VentureWorks 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 VentureWorks, 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.

### SPRING 2007: First place: Team #15 – Active EMI Filter Design – Robert Bosch Corporation



RIGHT TO LEFT:  
Dylan Asher Constan-Wahl,  
Ke (Coco) Zhang-Miske,  
Justin S. Weinberg, Byung-mo Kang,  
Muhammad Junaid Zaheer

### SPRING 2007: Second Place: Team #4 Mondialogo Contest Remote Diagnosis System – Chrysler Corporation



RIGHT TO LEFT:  
Kevin Scheel  
Thomas Wa-jiw Casey  
Kurtis David Hessler  
Joseph P. Hines  
Janelle Shane

### SPRING 2007: Third Place: Team #14, “Improved Beep Baseball” sponsored by DaimlerChrysler and the MSU Artificial Language Laboratory.



RIGHT TO LEFT:  
Andrew Schafer  
Matthew Raetz  
Wayne Steward  
Justin Marcus Ketterer  
Mark Mathias Ehrenberger  
Matthew Warpinski

### 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,  
Spring 2007:  
Freshmen/Sophomore Design  
Winners “Team #03” –  
Corey Kenuyl (3rd r-to-l)  
and Christina Gillman (middle) and instructor Pete Semig.



## Professor's Choice Award: Spring 2007 Winners:

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 #1 & 2, “NASA Robotic Arm” sponsored by NASA – Goddard SFC.



RIGHT TO LEFT  
Nicholas P. Tokarz, Truc Thanh  
Nguyen, James D. Marus, Joseph  
Baumgardner. Not shown in photo:  
Keith Ortman or Kacy King

### Teams #1 & 2, “Autonomous Terrain Mapping” sponsored by NASA–Goddard SFC.



RIGHT TO LEFT  
Timothy Wall, Daniel T. Merritt,  
Renaldo F. Ferguson, James Adam Pita  
Renaldo F. Ferguson (3-glasses)  
Nathan Furtwangler back, no glasses

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

## DECEMBER 2007 PROGRAM

### Middle School Events Schedule Thursday, December 6, 2007

EVENTS	8 a.m.	9 a.m.	10 a.m.	11 a.m.	Noon
FIRST Robotic Team		Parlor A 9 a.m. - noon			
Middle School Wireless Thermometer Build Project		Parlor B 9 a.m. - noon			
MSU Student Panel for Middle Schoolers		Parlor C 9 a.m. - noon			
Middle School Civil Engineering Build Project		Ballroom (Back) 9 a.m. - noon			
Middle School NXT Mindstorm		Green Room 9 a.m. - noon			
Lunch for all participants			2nd Floor Concourse Noon - 12:30 p.m.		
Awards Ceremony			Ballroom 12:30 p.m.-1:00 p.m.		

KEY:  All Participants  
 Middle School Event

### High School Events Schedule Friday, December 7, 2007

EVENTS	8 a.m.	9 a.m.	10 a.m.	11 a.m.	Noon
FIRST Robotic Team		Parlor A 9 a.m. - noon			
High School Wireless Thermometer Build Project		Parlor B 9 a.m. - noon			
MSU Student Panel for High Schoolers		Parlor C 9 a.m. - noon			
High School Civil Engineering Build Project		Ballroom (Back) 9 a.m. - noon			
High School NXT Mindstorm		Green Room 9 a.m. - noon			
Lunch for all participants			Lake Erie Room Noon - 12:30 p.m.		
Awards Ceremony			Ballroom 12:30 p.m.-1:00 p.m.		

KEY:  High School Event

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



Jamie Ramos  
Michigan State  
University



Drew 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, Green Room

### NEMO – NAVIGATING EAP-CONTROLLED MODULE WITH ONBOARD RESOURCES

Wireless Integrated Microsystems is a very important area of electronics. Using WIMS technology, engineers are able to build tiny devices that can do extraordinary things. WIMS technology will soon provide button-sized information-gathering nodes for applications ranging from environmental monitoring to healthcare. Most electronics now include some of the components of WIMS devices, even though they are not true WIMS devices. They could be fully integrated, wireless, but not built on the micrometer scale. They

could also have electromechanical parts on board, with truly being on the micrometer scale.

Currently, the Robotic Fish is capable of sensing the distance between itself and other fish, collecting the temperature of its environment and communicate wirelessly with a Base Station and other fish. Although the robotic fish is not truly a microsystem (as it is not built on the micrometer scale), it is highly integrated, wireless, and contains sensors capable of measuring and controlling the movement of the fish.

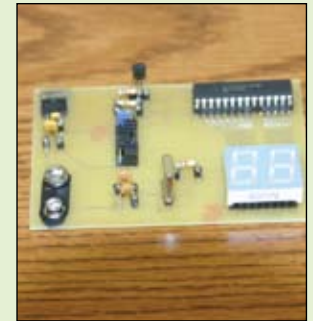


## 9:00–12:00 Second Floor, Parlor B

### WIMS DIGITAL THERMOMETER BUILD

Welcome to the WIMS Modules! These modules are specifically designed to integrate engineering concepts into existing science and math curricula with the goal of helping pre-college students become aware of the exciting field of engineering. Thermometers provide information about the temperature of an object. Temperature is a measure of the average kinetic energy of the individual particles in an object. Kinetic energy is the energy of motion and all particles are in motion even if the object

is not moving. When an object is heated the particles move faster. They have more kinetic energy and the temperature will be higher as a result. In a bulb thermometer, as the liquid is heated, its particles move faster and therefore, the volume of the liquid increases. This increase is normally not noticeable but in a thermometer, the tube in which the liquid rises is very narrow so that the change in the volume is obvious.



## 9:00–12:00 Second Floor, Parlor C

### 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. These presentations will provide the basis for seventh through twelfth grade students to ask questions and learn firsthand from the experts! A newly created engineering 9 minute-DVD will complement Honor Society student panel discussion. So 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!

#### Session Times

9:00–9:40

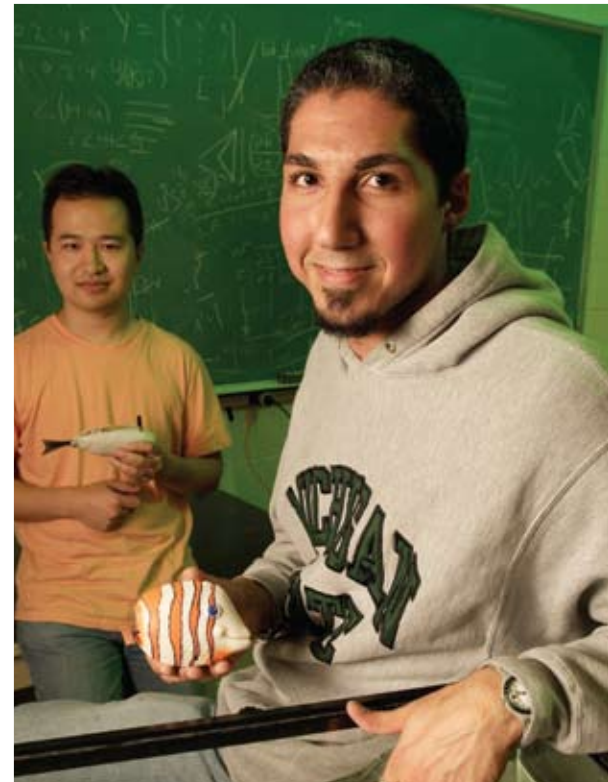
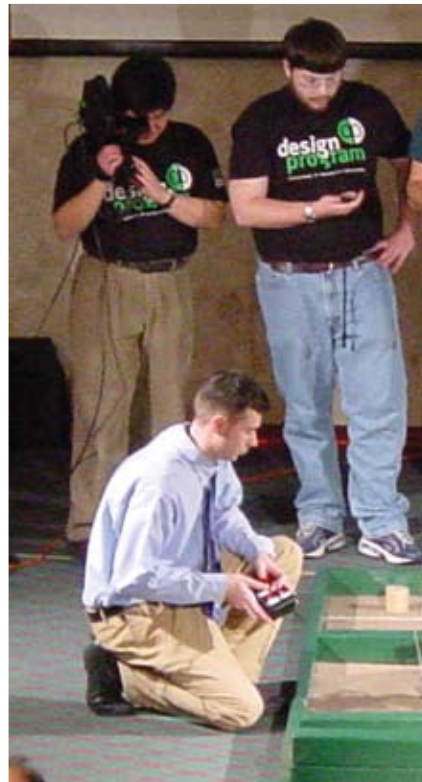
9:45–10:25

10:30–11:10

11:15–12:00

**Pi Tau Sigma participants**

**Eta Kappa Nu participants**





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Thermal Systems

Adaptive Cruise Control



Driving Control & Safety

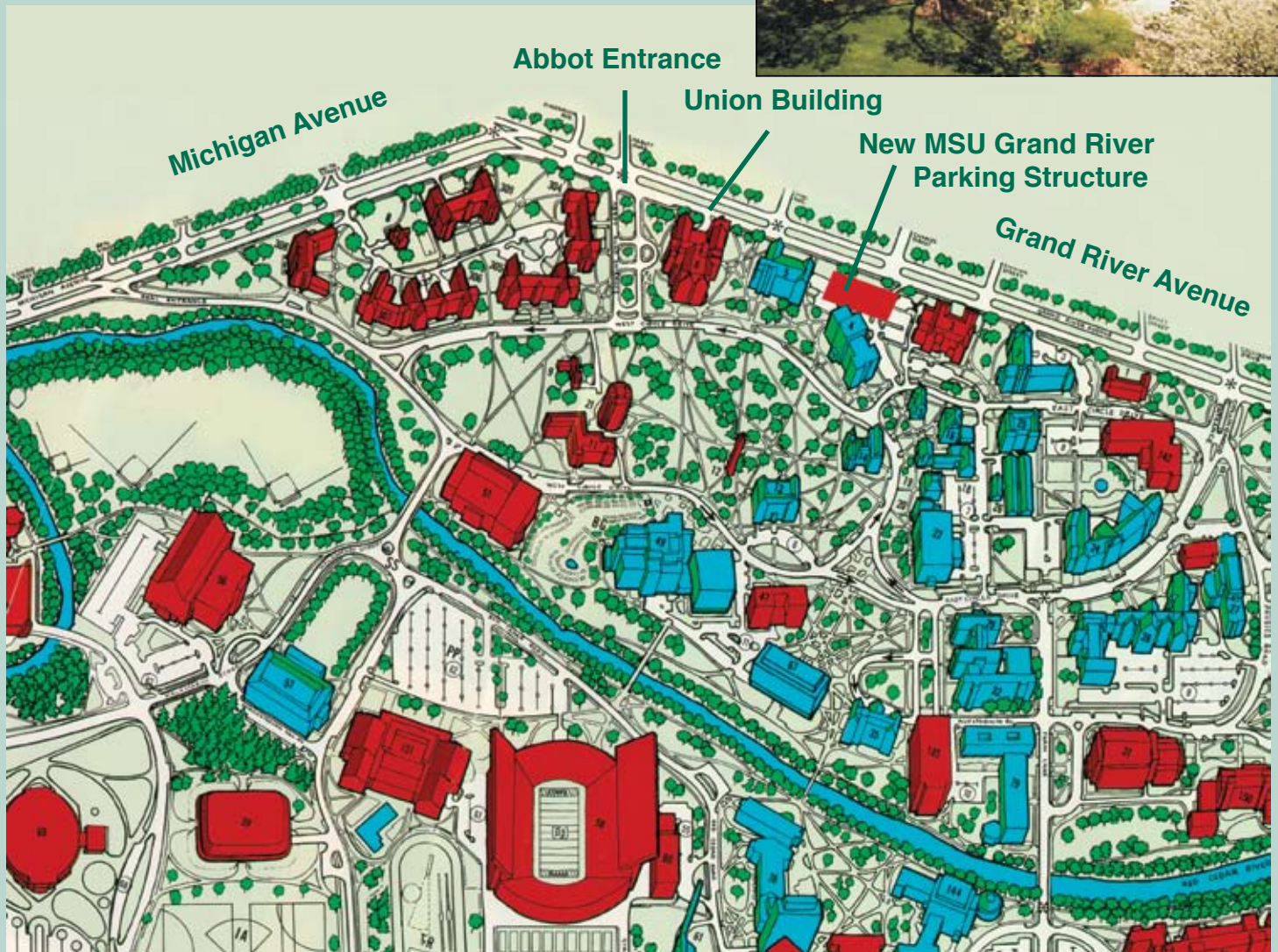
Navigation



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.



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The **prism** VentureWorks Prize



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