

MICHIGAN STATE
UNIVERSITY

The MSU College of Engineering

Fall 2010

Design Day

Proudly sponsored by
Auto-Owners Insurance



AUTO-OWNERS INSURANCE COMPANY
AUTO-OWNERS LIFE INSURANCE COMPANY
HOME-OWNERS INSURANCE COMPANY
OWNERS INSURANCE COMPANY
PROPERTY-OWNERS INSURANCE COMPANY
SOUTHERN-OWNERS INSURANCE COMPANY



~ Serving Our Policyholders and Agents for More Than 90 Years ~

December 10, 2010

Dear Students, Family Members, Company Representatives, Alumni, Faculty & Staff:

On behalf of Auto-Owners Insurance Company, and in partnership with Michigan State University, it gives me great pleasure to welcome you to the beautiful MSU campus and specifically to the MSU College of Engineering Design Day. We are pleased and honored to partner with Michigan State University in this program, which showcases the talents and abilities of many gifted students.

We are particularly pleased to partner with MSU on this event. It has been said the future belongs to the youth. If this is the case, (which we believe to be true) by the creativity, imagination, and initiative displayed by the participating students in this year's Design Day Program, you have to admit the future looks very bright indeed. A tremendous array of skills and abilities will be on display this year, which further substantiates our continued support of this program. We congratulate each participant along with those who have provided support, guidance and instruction to them.

As a recruiter of talent for the ongoing needs of our Company, I could not be more pleased with programs like Design Day, or the constant exposure to creative thinking that is provided through the daily course work at Michigan State University. We hire many graduates from numerous disciplines at MSU and as an alum, I could not be more proud. Auto-Owners Insurance has called Michigan home since our beginning in 1916. We consider ourselves, along with Michigan State University, one of the great success stories in this state. This year we were rated "Highest in Customer Satisfaction with the Auto Insurance Claims Experience, Three Years in a Row" by J.D. Power and Associates. It is because of our outstanding associates that we are able to receive such a great recognition and continue to grow.

I wish you a truly pleasant, exciting and stimulating day here on the MSU campus. May you be thrilled by the talent of the participants as well as the deep heritage of this campus. We at Auto-Owners Insurance join in congratulating all the participants, proud parents, and sponsors who took the initiative to support this program. Our best wishes to all for a wonderful day!

Sincerely,

Ronald H. Simon
Chairman of the Board



Auto-Owners Insurance Ranks "Highest in Customer Satisfaction with the Auto Insurance Claims Experience, Three Years in a Row"

- - J.D. Power and Associates



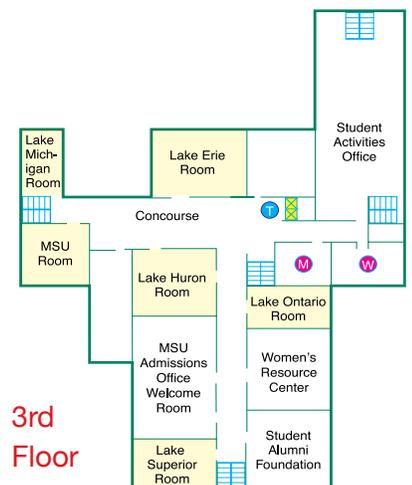
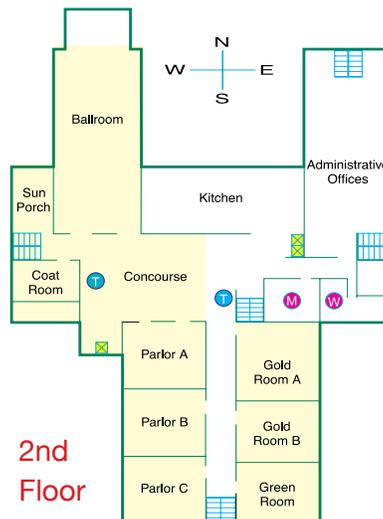
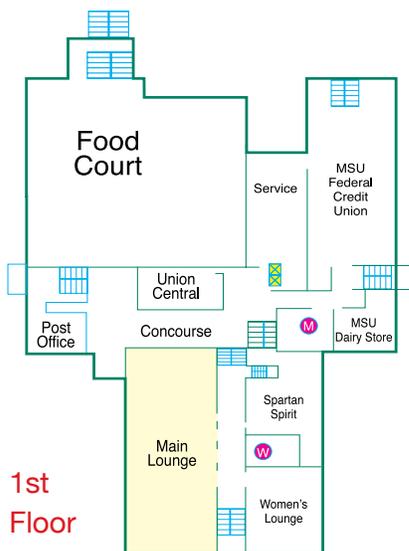
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Design Day Events Schedule: Friday, December 10, 2010

EVENTS	8 a.m.	9 a.m.	10 a.m.	11 a.m.	Noon	1 p.m.	
Audio Enthusiasts and Engineers	2nd Floor Concourse 8:00 a.m. – 1:00 p.m.						
Engineering Student Organizations		2nd Floor Concourse 9:00 a.m. – noon					
EGR 100 Presentations		2nd Floor Gold Room A 9:00 a.m. – noon					
ME 371 Demonstrations		2nd Floor Parlor A & B 9:00 a.m. - noon					
ME 412 Competition		2nd Floor Ballroom 9:00 a.m. - 10:45					
ME 456 Competition		Lake Erie Room 9:10 a.m. - 10:50					
ME 471 Competition		2nd Floor Ballroom 9:00 a.m. - 10:24					
CAPSTONE COURSES							
All Capstone Posters	1st Floor Lounge 8:00 a.m. - noon						
CE 495 Project Presentations		Lake Michigan Room 9:00 - noon					
CE 495 Project Presentations		MSU Room 9:00 - noon					
CSE 498 Project Presentations	Lake Ontario Room 7:45 a.m. - 11:40 a.m.						
ECE 480 Project Presentations		Lake Huron Room 8:30 a.m. - 11:30 a.m.					
ME 481 Project Presentations	Lake Superior Room 8:00 a.m. - 11:45						
LUNCH AND AWARDS							
MSU Lunch		2nd Floor Concourse 12:15 p.m. - 1:00 p.m.					
MSU Awards		Ballroom 1:15 p.m.- 2:00p.m.					
School Awards		Parlor C Noon - 12:10 p.m.					
School Lunch		Parlor C 12:10p.m. - 12:40 p.m.					

KEY: ■ CE event ■ CSE event ■ ECE event ■ EGR event ■ ME event ■ School event





A note from the Design Day Director

The College of Engineering welcomes you to Design Day! We wish you a very memorable event as you experience our students and their amazing talents through presentations, competitions, and posters.

We are proud to recognize Auto-Owners Insurance as the Fall 2010 Design Day Executive Partner. As a Lansing based Fortune 500 company, Auto-Owners Insurance has a rich history of engagement with Michigan State University.

As you visit our various exhibits throughout the MSU Union, please make sure you learn about the projects. Our students are an incredible group of people who love to share their enthusiasm for engineering.

An exciting part of Design Day is the approximately 200 middle school and high school students participating in the Dart Foundation Day of Engineering Innovation and Creativity for 7th-12th Grade Students. These future engineers will explore design principles with hands-on projects requiring the application of their creativity and ingenuity.

The headliners of the day are our graduating seniors as they present their design projects through exhibits, posters, and presentations. These projects represent the capstone of their educational career. You will see that MSU engineers are ready to lead, create, and innovate.

Design Day would not be possible without the continued support of our project sponsors who provide both funding and a professional experience for our capstone design teams.

Along with our Executive Partner, Auto-Owners Insurance, we thank our Supporting Partners Dow Chemical Corporation, Whirlpool and Norfolk Southern.

Please join us for the Design Day Awards ceremony in the Ballroom at 1:15 pm when we will honor all of our talented Spartans, the best of the best.

Sincerely,

A handwritten signature in black ink that reads "Maureen E. Blazer-Adams". The signature is written in a cursive, flowing style.

Maureen E. Blazer-Adams
Director, Design Day
MSU College of Engineering

STAFF ACKNOWLEDGEMENTS:



Roy Bailiff



Jill Bielawski



Linda Clifford



Kelly Climer



Cathy Davison



Craig Gunn



Phil Hill



Matt Jennings



Debbie Kruch



Jamie Lynn Marks



Garth
Motschenbacher



Mary Mroz



Gregg Mulder



Stephen Paslaski



Roxanne Peacock



Adam Pitcher



Norma Teague



Teresa VanderSloot



Brian Wright

MACHINE SHOP AND DESIGN LAB STAFF:

Ken Barlage
Russ Tindall
Colin Perrault

"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.



Middle & High School Innovation & Creativity Day

December 10, 2010

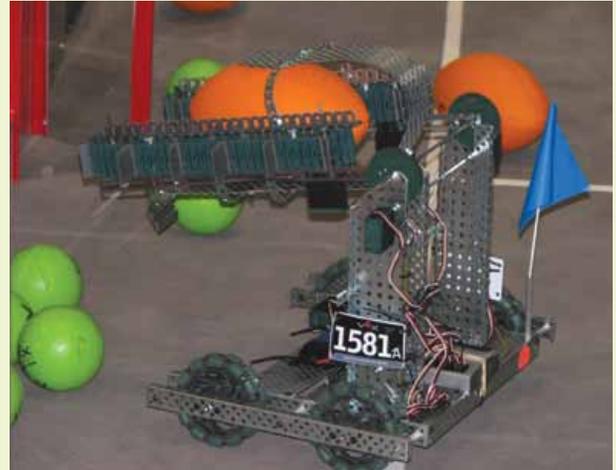
Precollege Student Voting: *During the morning on Design Day all visiting precollege students will be viewing Engineering Projects and voting.*

During this time college students will have a chance to interact with “non-engineering” students and demonstrate the underlying principles from their projects. This interaction allows the college students an opportunity to practice explaining engineering concepts to non-engineers. As the precollege students work their way through the wide variety of presentations they will get an overview of the many different branches of engineering. Additionally, as the precollege students see both entry-level and advanced engineering applications, it allows them to see the natural progression of engineering. Lastly, this session also provides a chance for the precollege students to interact with student organizations within the College of Engineering.

	C.E./M.E. Team Build Parlor B – 2nd Floor	VEX Robotics Parlor C – 2nd Floor	1st & 2nd Floor Voting
9:00–9:55	Schools 1 & 2	Schools 5 & 6	Schools 3 & 4
10:00–10:55	Schools 3 & 4	Schools 1 & 2	Schools 5 & 6
11:00–11:55	Schools 5 & 6	Schools 3 & 4	Schools 1 & 2
12:00–12:10	All students in Parlor C for the awards ceremony. Lunch will immediately follow.		

VEX ROBOTICS

Our team of experts has designed a lab experience to give precollege students an introduction to robots. Students will work in small groups and have a hands on approach learning to control the VEX robot. They will write programs using Robot C language and they will program the robot to be controlled by a remote control. Application and discovery of how programming works will be similar to lessons presented in science and math classes. Each team will discover how to adjust their programs based upon the program inputs and actual output (robot performance). During each phase, new challenges will be introduced to engage the students. This will reinforce new ideas and concepts while exposing student to the newly emerging capabilities of student-controlled robotics programs.



INTERDISCIPLINARY ENGINEERING BUILD

In this build you and your team will be integrating practices from multiple fields of engineering to build and evaluate a support system. Support systems can range from simple beams to intricate bridges composed of gussets, trusses, cables, etc. These types of systems are used throughout Civil, Mechanical and Structural Engineering works. This session will start with a brief introduction to the forces and stresses that act on support systems. Additionally, you will see how digital sensors can read and convey data about these stresses to a computer. We will also look at the computer code that takes this raw data and converts it into a format that can easily be interpreted.

During the build portion of this session you and your team will be given the design constraints for the structure. Utilizing the information learned at the start of the session and the limited materials provided, your team will need to design and then construct a model to be tested. Your finished structure will be placed on one of our test beds for evaluation. With the help of MSU Engineering students, the results will be collected by a sonic ranging sensor. These data points will be interpreted by the computer program and your team will be evaluated on percent deflection of your support. Throughout this session you will need to listen, learn and utilize your team to be successful. Good Luck.



Drew Kim
MSU Engineering
Assistant to the Dean
Recruitment, Scholarships,
and K-12 Outreach



Jamie Lynn Marks
MSU Engineering
Recruitment and
K-12 Outreach



Russ Pline
Okemos High School
and MSU Design Day
Coordinator



Bob Watson
MSU Engineering
K-12 Outreach
LEGO and VEX
Robotics Coordinator



John Thon
Holt Junior
High School and
MSU NSF RET
SITE Lead

EGR 100

9:00 – 12:00
Second Floor
Gold Room A

INTRODUCTION TO ENGINEERING DESIGN

INSTRUCTIONAL TEAM: Dr. Neeraj Buch, Dr. Jongeun Choi, Dr. David Grummon, Mr. Timothy Hinds, Dr. Bradley Marks, Dr. Punya Mishra, Dr. Jon Sticklen, , Dr. George Stockman, Dr. Xiaobo Tan, Dr. S. Patrick Walton, Dr. Thomas Wolff

TA STAFF: Nicholas Brake, Wouter Brink, Jacob Co, Brian Romanowski, Brad Rutledge, Greg Schafer, Dan Williams, Ryan Wood

MENTOR STAFF: Michael Conboy, Austin Crawley, Ryan DeBono, Nicholas Lehman, Allison Mills, Jeremy Racine, Justin Raymond, Landon Riker, Cory Snowdin, James Solce, Corbin St. Aubin, Russell Tindall, Danielle Vasko, Justin Ward, Ollie Zemanek

PROBLEM STATEMENT

EGR 100, Introduction to Engineering Design, is a college-level course required of all incoming first-year engineering students. It is an integral part of the Cornerstone Engineering and Engineering Residential Experience programs. The course introduces students to the engineering profession and the engineering design process through team-based, interdisciplinary design projects and assignments. Over 600 students are enrolled in EGR 100 this semester.

For the final course project the student teams of EGR 100 could choose from two projects (i) solar water heater design and (ii) Lego Mindstorm Competition. For the first choice the students had to design, build and test a solar water heater that will successfully increase the temperature of a given volume of water in a fixed time (5 minutes). The prototypes were to fit within a specified test fixture containing the water reservoirs and connection ports. The second choice required the students to build and program an autonomous robot that competes simultaneously against other robots to gather high-scoring, colored balls. Points were awarded to teams based upon the values of the balls in the team's goal area at the end of the competition. At the Design Day the teams will display a poster detailing their concepts. Precollege students will recognize the most outstanding project with awards.



Dr. Buch



Dr. Choi



Dr. Grummon



Mr. Hinds



Dr. Marks



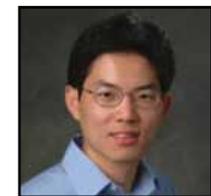
Dr. Mishra



Dr. Sticklen



Dr. Stockman



Dr. Tan



Dr. Walton



Dr. Wolff

BE 485 BIOSYSTEMS DESIGN TECHNIQUES

**PROJECT INSTRUCTORS: STEVEN SAFFERMAN, PH.D., P.E.
AND STEVE MILLER, P.E.**

Biosystems Engineering

Biosystems engineers integrate and apply principles of engineering and biology to a wide variety of socially important problems. The MSU biosystems engineering program prepares graduates to:

- Identify and solve problems at the interface of biology and engineering, using modern engineering techniques and the systems approach and
- Analyze, design, and control components, systems, and processes that involve critical biological components.

MSU biosystems engineering graduates are having a positive impact on the world, working in areas such as ecosystems protection, food safety and biosecurity, bioenergy, and human health.

2010-2011 BIOSYSTEM ENGINEERING DESIGN PROJECTS

Site Evaluation and Design Plan for a Created Forested Wetland

Student Team: Alyse Egner, Kevin Koryto, Hanna Miller

Client: Michigan Department of Transportation

Facility Advisor: Dawn Reinhold, Ph. D.

Wetland mitigation law requires the creation of forested wetlands to replicate the ecosystem services that were disturbed by development. The project entails the development of a comprehensive site evaluation and design for the construction of a forested wetland. Activities include modeling of hydrologic function, analysis of soils, designation of native vegetation, and design of hydrological control structures.

Best Management Practice Recommendation for Escherichia coli in the Red Cedar Watershed

Student Team: Catherine Dudgeon, Jennifer Jury, and Cody Kurzer

Client: Ingham County Health Department and Michigan Department of Natural Resources and Environment

Facility Advisor: Pouyan A. Nejadhashemi

An impairment of the Red Cedar River watershed resulted from Escherichia coli. The Ingham County Health Department has a substantial amount of data that can help determine the cause. Land use and hydrological modeling will be used to help determine potential sources.

2010-2011 BIOSYSTEM ENGINEERING DESIGN PROJECTS



Wastewater Treatment System Upgrade for a Small Cheese Producer

Student Team: Megan Buhl, Shannon Henderson, Stephanie Shaulis

Client: Farm Country Cheese House

Facility Advisor: Larry Stephens

The Farm Country Cheese House, a small cheese producer serving an Amish community, needs to upgrade their wastewater treatment system in order to accommodate a planned expansion in production while remaining compliant with all regulations. This project entails selecting the best process and preparing construction plans and specifications.

Developing Process Alternatives to Produce Consistent Meatless Burgers across Multiple Production Lines

Student Team: Ellen Bornhorst, Cassie Giacobassi, James MacLellan, Drew Selden

Client: Major Food Processor

Facility Advisor: James Steffe

Meatless burgers manufactured from two lines at the same food processor are not consistent. A detailed characterization of each production line will be conducted to determine potential causes. Process recommendations will be made so that consistent products can be formulated at a minimum cost.

Urban Aquaculture Modeling and Feasibility

Student Team: Qudus Ahmed, Michael Holly, Blake Lougheed, and Andy Tran

Clients: Pingree Farms, Aquaculture Research Corporation, and Urban Agricultural Initiatives of Detroit

Facility Advisor: Yan "Susie" Liu

Aquaculture offers the potential to provide fresh food and jobs in an urban environment. A generic model to simulate urban aquaculture will be developed and potential costs/benefits will be determined. To optimize the quality and usability of the model, an onsite case study will be conducted at a specific site in Detroit.

2010-2011 BIOSYSTEM ENGINEERING DESIGN PROJECTS

BE 485

Details of 2010-2011
Design Projects

Sustainable Heat Systems: Investigating the Feasibility of Corn Drying using Biomass Combustion

Student Team: Sam Prentice, Shaun Madsen, Kyle Fischer and Nick Steo

Client: Dr. Ajit Srivastava, Michigan State University

Facility Advisor: Larry Klope

As the price of propane and the importance of reducing fossil fuel dependency increase, renewable heating systems are becoming a practical alternative. A biomass combustion system to provide heat for an on-farm corn drying operation will be designed and built. Operational costs will be analyzed and compared to conventional propane heating systems.

Escherichia coli Source Identification and Detection in Recreational Waters

Student Team: Asmaa Abdel-Azim, Bridget Bednark, Drew Coatney

Clients: Ingham County Health Department and Michigan Department of Natural Resources and Environment

Facility Advisor: Evangelyn Alocilja

To aid in the determination of the source of bacteria impairment in the Red Cedar River, a rapid and efficient Escherichia coli detection system sensitive to a concentration of 300 colonies/100 mL is needed. The best detection approach will be investigated, focusing on a design developed in a previous design project. A systematic monitoring approach based on current land use will also be developed to aid in the identification of the likely source of impairment.

Bio-Fuel Source Optimization through Torrefaction

Student Team: Spencer Beatty, Ryan Black, Ryan R. Rochelle, Jason S. Smith

Client: Dr. Chris Saffron, Michigan State University

Facility Advisor: Chris Saffron

Alternate, renewable fuel is a national priority. Wood that is first charred (torrefied) at the site of collection offers the potential to serve as an alternative but more research is needed. A bench-scale torrefaction reactor will be designed and fabricated to use pelletized woody biomass or small wood chips. Additionally, a system analysis of the use of torrefied feedstocks at a coal-fired power plant starting at the production of the biomass source will be performed in order to compare the torrefied wood with coal in terms of energy value per unit cost.

CE 495

9:00 – 12:00 noon
MSU and Lake
Michigan Rooms

CE 495 SENIOR DESIGN IN CIVIL ENGINEERING

FACULTY ADVISORS: : Professors: Chatti, Haider, Kodur, Maleck, Masten, and Wallace



Chatti



Haider



Kodur



Maleck



Masten



Wallace

Student-teams developed preliminary designs for elements of MSU’s Facility for Rare Isotope Beams (F-RIB) – the \$550 million cutting-edge research facility to advance understanding of rare nuclear isotopes and the evolution of the cosmos. As envisioned in this planning exercise, construction of the facility would include deep excavation for the 1000 foot long linac tunnels, permanent removal of Bogue St. between Shaw and Wilson, and construction of a stormwater wetland to reduce impacts of the urbanized campus on the Red Cedar River. Teams developed preliminary plans for the following civil engineering issues: temporary excavation shoring and utility bridging required to construct the linac tunnels; maintenance of campus vehicular and pedestrian traffic; post construction storm water management.

PROFESSIONAL EVALUATORS

Engineers and scientists associated with the following firms, municipalities, and companies donated time to provide students with a practicing professional’s perspective: Bergmann Associates; Consumers Energy; East Lansing Dept of Public Works; Fishbeck, Thompson, Carr & Huber; HNTB; JF New; NTH Consultants; Soil & Materials Engineers; Tetra Tech MPS; URS Corporation; and Wilcox Professional Services. We gratefully acknowledge their generous contributions.

Rick Chelotti, PE
Bergmann Associates
Lansing, MI

John LeFevre, PE
FTCH, Inc.
Lansing, MI

Thiru Thiruvengadam, PhD, PE
Consumers Energy (retired)
Okemos, MI

Daniel Christian, PE
Tetra Tech MPS
Lansing, MI

Peter Margules, PE
NTH Consultants
Northville, MI

Anthony Thomas, PE
Soil & Materials Engineers
Shelby Twp., MI

Matt Junak, PE
HNTB
E. Lansing, MI

George McKenzie, PE
NTH consultants
Lansing, MI

Phil Vogelsang, PE
URS Corporation
Grand Rapids, MI

Stu Kogge
JF New
Ann Arbor, MI

John Saller, PE
Wilcox Prof. Services, LLC
Lansing, MI

Todd Sneathen, PE
Director of Public Works
E. Lansing, MI

Michael J. Thelen, PE
Soil & Materials Engineers, Inc.
Lansing, MI

**Award
Sponsors**

BARR

ftc&h

CE 495 SENIOR DESIGN IN CIVIL ENGINEERING



TEAM 1 : (Back l-r) Nick Kuelske, Nathan Bouvy, Michael Stoddard, (Front l-r) Jeamie Deacon, Maggie Kronlein, Andrew Moran, Paul Schiefer



TEAM 2: (Back l-r) Jay Wangeman, Geoff Wilson, Dylan Haan, Charles Grubham III, (Front l-r) Brad Crandall, Thomas Speer, Jeremy Ravitz



TEAM 3: (Back l-r) Steven Parse, Joe Johnston, Corey DenUyl, Brent Kanners, (Front l-r) Jamie Sleder, Mahmood Farooqi, Gelnna Wood



TEAM 4: (Back l-r) Christopher Fournier, Nick Majchrowski, Tyler Haan, Jeremy Vanlerberg, (Front l-r) Chris Chatfield, Jennifer Noblit, Craig Lynch,

Team	Time	Room
Team 1	9:00 a.m.	MSU Room
Team 2	9:00 a.m.	Lake Michigan Room
Team 3	10:30 a.m.	MSU Room
Team 4	10:30 a.m.	Lake Michigan Room

CE 495 Senior Design in Civil Engineering

Undergraduates in civil engineering must take CE 495. This capstone course prepares students for the workplace by providing an experience with the following challenges:

- A project with multiple issues that must be resolved using civil engineering knowledge;
- Formulation of conceptual solutions and resolution of conflicting design elements;
- Development of plans that comply with regulations and provide a basis for cost estimates;
- Balancing individual responsibility and group participation in a team based effort;
- Preparation of written reports and oral presentations.

CIVIL ENGINEERING SENIOR DESIGN AWARD

The Civil Engineering Senior Design Award (\$700 and plaques) is presented to the best team as judged by the faculty and a panel of practicing engineers.

Each team is responsible for developing a design that addresses environmental, geotechnical, hydrological, pavement, transportation, and structural issues for the project. A student project manager coordinates each team. Design reports are judged by the faculty; progress reports and the oral presentations are judged by a board of practicing professionals.

The faculty and students of the Department of Civil and Environmental Engineering gratefully acknowledge the generous contributions from Fishbeck, Thompson, Carr & Huber, Inc. (FTC&H) and from Barr Engineering Co. These companies currently make this award possible. FTC&H is a professional civil engineering, environmental consulting, architectural/engineering, and

construction management firm with clients in Michigan and throughout the nation. Barr Engineering is a professional engineering company providing engineering, environmental, and information technology services to clients across the nation and around the world.



Winning Team #5

Lt to Rt: Dr. Roger Wallace, Michael Bertapelle, Nick Elliott, David Stringer, Danny Strayer, Charles Schalhorn (missing: David Roth, Erik Zuker)

Computer Science and Engineering

Capstone Course Sponsors

We thank the following companies for their generous support of the computer science capstone course.

Auto-Owners Insurance
Lansing, Michigan



The Boeing Company
St. Louis, Missouri



Ford
Dearborn, Michigan



GE Aviation
Grand Rapids, Michigan



Medtronic. Inc.
Mounds View, Minnesota



Meijer
Grand Rapids, Michigan



Motorola
Schaumburg, Illinois



TechSmith
Okemos, Michigan



Urban Science
Detroit, Michigan





Computer Science and Engineering Capstone Course Projects

Presentation Schedule – Lake Ontario Room

Dr. Wayne Dyksen, Professor

Time	Company	Project Title
7:45am	Auto-Owners Insurance	Agent Multimedia Ad Builder
8:10am	The Boeing Company	O-Show for Simulation Software
8:35am	Ford Motor Company	Ford Idea Place Mobile Edition
9:00am	GE Aviation	Super Synoptics
9:25am	Medtronic, Inc.	Medtronic Wellness Portal
9:50am	Break	
10:00am	Meijer	ITS Products and Services Request System
10:25am	Motorola	Enhanced Program Guides for Mobile Devices
10:50am	TechSmith	Extending Apps with Cloud Asset Sharing
11:15am	Urban Science	Modern Online Analytical Processing Cube

CSE 498 Collaborative Design

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

- Architecting, implementing, and delivering 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.

Project sponsors are local, regional, and national, and have included Auto-Owners Insurance, Boeing, Chrysler, Ford, GE Aviation, General Motors, IBM, Medtronic, Meijer, Microsoft, Motorola, Raytheon, Sircon, TechSmith, Terex, Toro, the Union Pacific Railroad, and Urban Science.

Auto-Owners Insurance Agent Multimedia Ad Builder

Auto-Owners Insurance provides many different advertising resources to their independent agents. A significant part of this service involves a set of templates of ads, which are available to their agents via their web-based Media Center.

In order to make this process easier for both parties, we have created a web application, the Agent Multimedia Ad Builder, that allows agents to create print, TV, and radio ads that are specific to their agency.

The web application allows agents to create profiles with basic information such as agency name and location, which is then automatically incorporated into one of the ad templates. This process makes customization much more convenient since agents simply need to pick a template they like and all their agency information will be used to create the corresponding ad.

For agents who want to include their own touch of editing into the ads, we have created a basic web editor for print ads that lets them drag and drop different pictures into the template. The editor also allows them to edit the written content in place on the ad.

All of the created ads are able to be previewed and saved for later visits through the application. Ads that are complete and ready for submission will be able to be sent for approval by Auto-Owners Insurance to ensure that the ads are cleared for publication.



Michigan State University Team Members (left to right)

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Marie Buckner
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Auto-Owners Insurance Corporate Sponsors

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The Boeing Company O-Show for Simulation Software

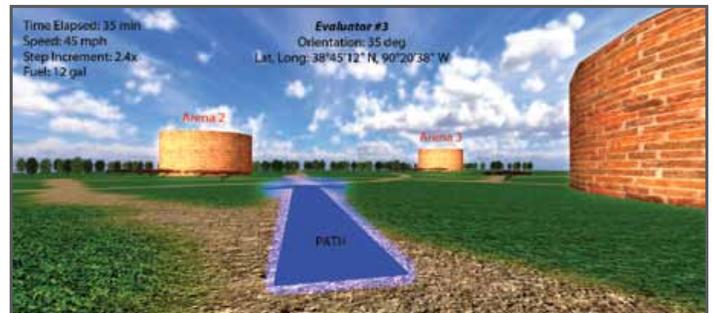
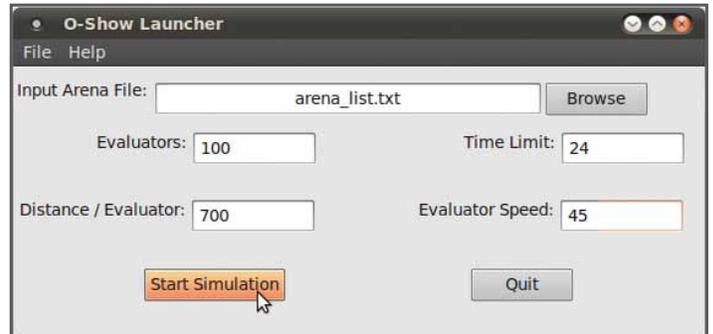
The Boeing O-Show project is a joint effort between Michigan State University and The Boeing Company to develop specialized software to find and simulate an optimized path for multiple units traveling to a large number of destinations. O-Show stands for “Optimize and Show.”

O-Show is best understood with an illustrative example of how it might be used. Imagine that there are many evaluators who are tasked to evaluate certain properties of basketball arenas in a given state within a given timeframe.

In this scenario, our software allows the user to configure evaluator travel speed, number of evaluators, a starting point, maximum allowed evaluator travel distance, and a list of arenas to visit. The main goal is to optimize the routes of the evaluators in a way that minimizes the number of them needed to accomplish the mission.

The software comprises two parts. First, a launcher takes the inputs for the desired problem. The launcher then feeds the inputs to lp_solve, which is a software library used for solving linear programming models. The launcher then receives the results of lp_solve’s calculations, completing the “Optimize” part of our simulation. After that, our “Show” aspect of the simulation takes over.

“Show”—the visualization—is written in a graphics library called OpenSceneGraph and is used to render a graphical representation of the people, places, and paths of our simulation.



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Bryan Askins
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The Boeing Company Corporate Sponsors

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Saint Louis, Missouri

Matt Daniels
Saint Louis, Missouri

Jayson Vincent
Saint Louis, Missouri

Steve Yallaly
Saint Louis, Missouri

Ford Motor Company

Ford Idea Place Mobile Edition

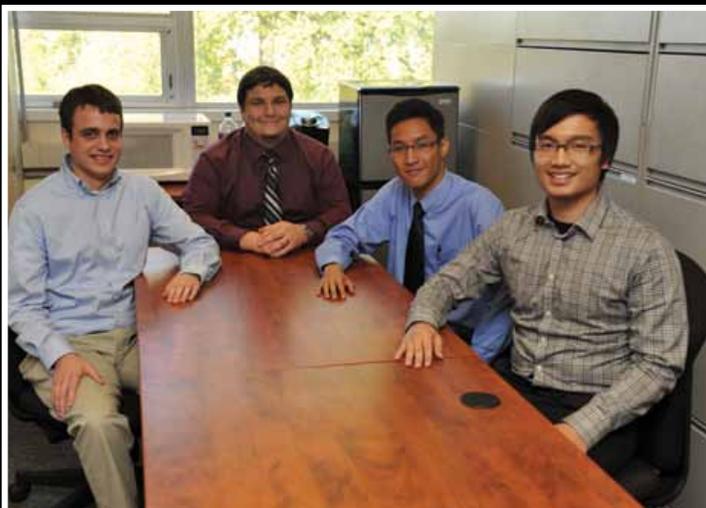
A company's most important assets are its employees and their ideas. In order for employees to document and share these ideas, Ford has developed an online application called Ford Idea Place.

Ford employees work at many locations, including at manufacturing plants and at supplier facilities. When someone gets an idea at such a location, say on a plant floor, they may not have access to Ford Idea Place. By the time access is available, the idea may be lost.

To address this issue, Ford partnered with Michigan State University, tasking a team of students with developing a mobile solution that is built on Ford Idea Place. The result is Ford Idea Place Mobile Edition.

Ford Idea Place Mobile Edition consists of two custom apps, one for the iPhone and one for the Android, which allow users to share ideas anytime, anywhere. It features the ability to post, view, rate and comment on ideas. Users can even subscribe to authors and categories to keep them updated with ideas that could impact their work stream. As added incentive, users are also awarded achievements for various milestones like posting their first idea.

Further expanding its capabilities, the application can use the device's physical resources to attach photos, audio or video to ideas. Such functionality allows users to capture an idea fully while the platform's mobility allows these features to be accessed from anywhere, any time.



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Michael Volk
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GE Aviation Super Synoptics

Trying to decipher the vast array of dials, gauges, switches, and indicators on a modern aircraft flight deck is a challenging task even in ideal conditions. Compound the problem with flashing lights and warning buzzers from an emergency situation, and it's easy to see why in-flight problems present difficult and potentially serious challenges for pilots.

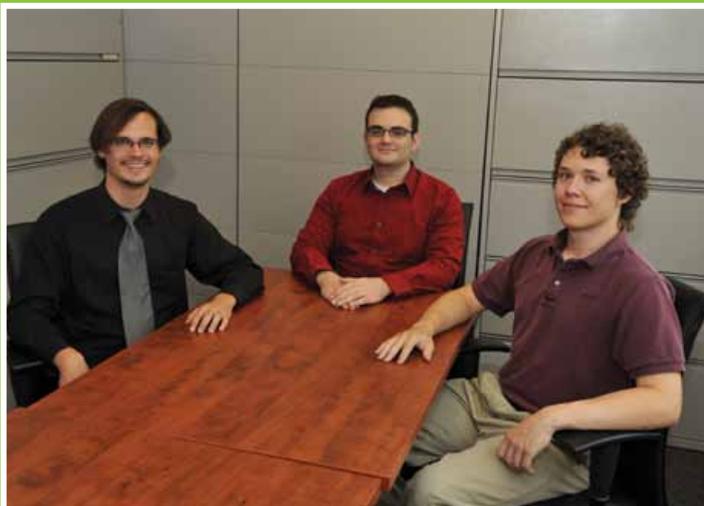
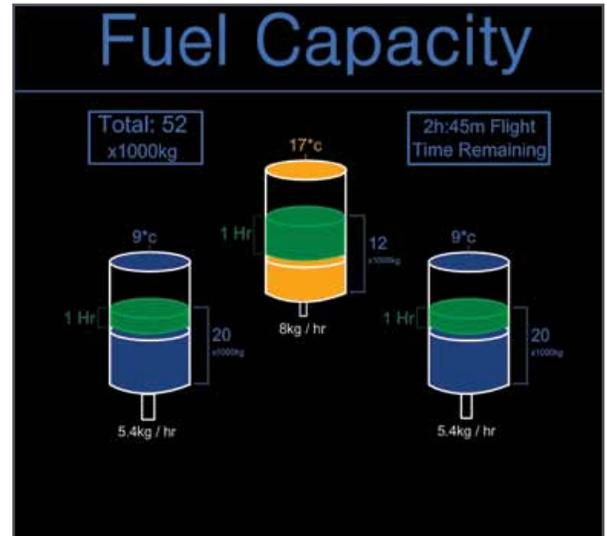
Working with GE Aviation, we have designed and built Super Synoptics, a new display which will help pilots better manage an aircraft, particularly during emergency situations.

Super Synoptics provides superior, intuitive instrumentation displays, along with summaries and solutions to current, emerging, and potential aircraft system failures.

Our design streamlines the flight crew's decision making process, by presenting them with situation-applicable information without overwhelming them with system information that is not currently relevant.

Super Synoptics is designed with a simple, clean, cursor-free screen navigation scheme, which is important in turbulent and emergency situations where cursors, whether via mouse or touch-pad, are unreliable and impractical.

The Super Synoptics system is comprised of the Super Synoptics Display, built with OpenGL, and is interfaced with the X-Plane flight simulator, which is used to simulate an aircraft and demonstrate the use of our system. The two applications communicate via a data plugin and TCP sockets.



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Aaron Gannon
Grand Rapids, Michigan

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Medtronic, Inc.

Medtronic Wellness Portal

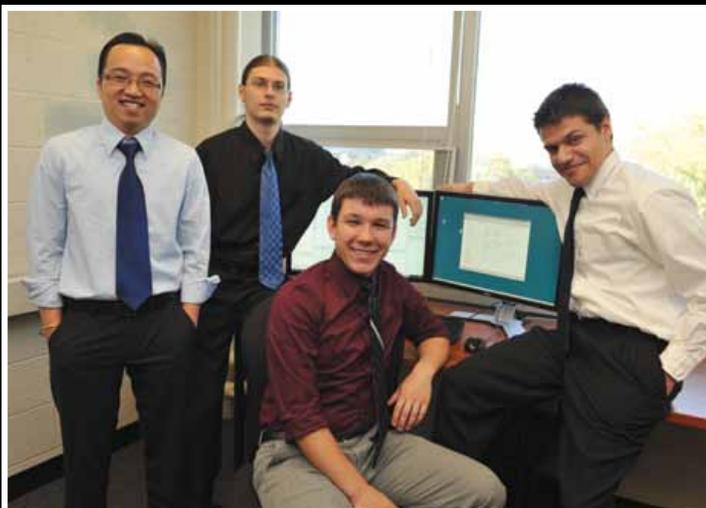
For over 50 years, Medtronic's mission has been to alleviate pain, restore health, and transform the way the world treats chronic diseases so patients can live a fuller life. To this end, the Medtronic Wellness Portal enables patients to manage their diet, health, and activity levels in a streamlined, more convenient way.

The heart of the Wellness Portal is to help a patient understand the impact of their food and exercise choices on their overall wellness. Patients can track a wide range of goals such as weight, activity levels, blood sugar, or daily calorie intake, with a goal to reinforce healthy choices.

The Wellness Portal is comprised of web and iPhone applications that allow users to quickly input data. If, for example, the user wishes to track a daily caloric input, the application has a fast and easy way to input food eaten at any time of the day. The user can see at a glance the total calories consumed compared to the daily goal.

Along with user input, the portal also automatically inputs and tracks data from the patient's Medtronic devices, such as insulin pumps or a continuous glucose monitor, as well as from the user's Google Health account. Graphs are used to show data correlation and, by using analytics, appropriate observations and recommendations are made.

The web application is written in Grails, a web framework for Groovy. The iPhone app is written in Objective-C.



Michigan State University

Team Members (left to right)

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Corporate Sponsors

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Mounds View, Minnesota

Scott Mark
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Javaid Masoud
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Karin Petty
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Mounds View, Minnesota

Meijer ITS Products and Services Request System

Meijer ITS—Information Technology Services—provides products and services to all divisions within the company. Currently, there is no single web site where ITS products and services can be found and requested by Meijer employees.

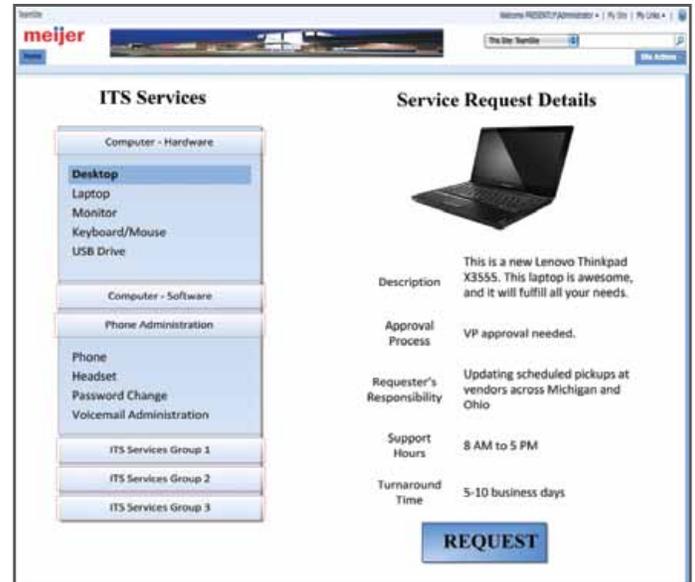
We have developed a web portal built upon SharePoint, which consolidates all ITS products and services. In addition, our portal includes a standardized form for all requests.

The portal directs customers to the ITS Service Request Catalog. Customers are then able to view the available products and services via an expandable menu. When a service is selected from the menu, a detailed description of the service is displayed. Once the desired service is found, the user is directed to the corresponding form to request it.

After a form is filled out and submitted, a copy of the form is stored within SharePoint and an email is sent to the existing ticketing system, which handles such requests.

The goal of our web portal is to make it easier for Meijer employees to find and request the desired ITS products and services and to provide the ability to view the status of their request, thereby allowing ITS to provide quicker request turnaround rates. By using our web portal, the user and ITS will save valuable time, thus increasing productivity.

The site is developed in ASP.NET and C#. The forms are created with Microsoft InfoPath. The database is created with Microsoft SQL Server 2008.



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Motorola Enhanced Program Guides for Mobile Devices

Television has become more intertwined with the World Wide Web than ever before. With the emergence of smart devices, consumers are connected wherever they go. Motorola aims to leverage these platforms and give consumers the ability to follow their favorite programs wherever they may be, while providing a television viewing experience unlike any other.

Our Enhanced Electronic Program Guide (EEPG) allows a content provider to create and manage supplementary content through an easy to use web interface. The provider can associate this content with a TV program and choose a specified time when it should appear on a synced mobile device during the viewing of a show. This content can be used to enhance the television experience by providing new and exciting information to the viewer as a show airs.

The EEPROM allows consumers to receive this supplementary content on their mobile device as they watch their favorite shows. The EEPROM is presented in an intuitive interface that alerts the user when new content is available. It displays the content in a non-intrusive manner and in user selectable layers.

The EEPROM service is written in Java with a RESTful architecture and deployed on a Glassfish server. Our persistent data is stored on a MySQL database and accessed through an iBatis persistence layer. The Secondary Content Creation Tool is written in Java using Google Web Toolkit and the iPad mobile application is written in Objective C.



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Brian Cripe
Medfield, Massachusetts

Drew Hanlon
Grosse Pointe Shores, Michigan

Motorola Corporate Sponsor

Kabe Vanderbaan
Schaumburg, Illinois

TechSmith

Extending Apps with Cloud Asset Sharing

TechSmith is harnessing the power of the cloud to create a new resource for sharing and acquiring assets for two of their most popular programs, Snagit and Camtasia Studio. Using Microsoft's Windows Azure cloud platform, this program enables users to easily browse and download shared assets or to upload and share assets with friends, groups, or the whole world. Sharable assets include things like images and video clips created by users, as well as other graphical elements such as callouts and title screens.

Once a user has downloaded a new asset, it is automatically installed into the correct location for each program for immediate access. Additionally, a special plug-in for Snagit allows users to instantly save their images to the cloud.

Users will enjoy a more efficient and richer experience as we make it easier for them to share and find these assets.

Snagit is a screenshot program that replaces the native Print Screen function with additional features, such as the ability to take shots of entire web pages or shots of the contents of a program window. It also contains a built in editor that automatically opens after taking a shot.

Camtasia is a screen video capture program that allows users to capture what is happening on their screen in video. The user may define the area of the screen or the window that is to be captured or the whole screen can be recorded instead.



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Urban Science

Modern Online Analytical Processing Cube

As one of the most trusted sources of analytical data in the industry, Urban Science helps their automotive and retail clients plan effectively, define and measure performance, and develop sales and marketing programs that deliver results.

In order to produce these results, very large amounts of data need to be analyzed very quickly and efficiently. A special kind of database structure—OLAP (OnLine Analytical Processing) cube—is used as a querying tool with a user-friendly interface.

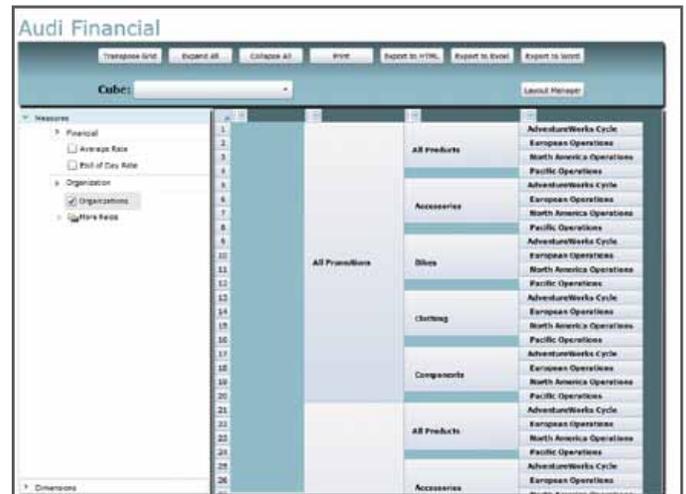
The figure at the right shows our OLAP cube dashboard interface and functionality.

Our dashboard is accessible from the internet, while the database is stored at a remote location off-site. Customers need not install any additional software, thus giving our program a zero-footprint for our end-users.

Users can manipulate the various dimensions available to them based on a given set of data and view it in a pivot. The PivotViewer enables the user to present extensive data so it can be manipulated for sorting and saving for later use.

A widely requested functionality for this program is the ability to print data, which is provided by a one-click PDF link.

The program uses Microsoft Silverlight and XAML for the interface, ASP.NET and C# for the processing, and Microsoft SQL Server and MDX for database manipulation.



Michigan State University Team Members (left to right)

Nathan Goodrich
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Dinesh Banda
Troy, Michigan

Ryan Kelly
Farmington Hills, Michigan

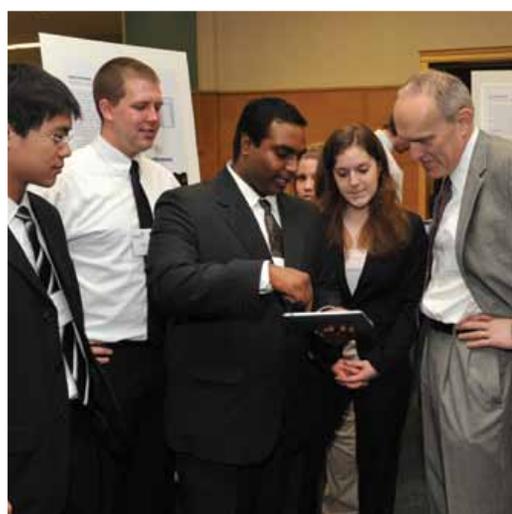
Urban Science Corporate Sponsors

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Detroit, Michigan

Randy Berlin
Detroit, Michigan

Mark Colosimo
Detroit, Michigan

Suzanne Dubois
Detroit, Michigan



Computer Science and Engineering

Design Day 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. The winners are selected on Design Day by a panel of distinguished judges.

Auto-Owners Insurance Exposition Award



CSE 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 to and answer questions from Design Day attendees. Each team plays their project videos and answers questions for a panel of judges.

The CSE capstone team with the best overall Design Day performance is honored with the Auto-Owners Exposition Award, which is sponsored by Auto-Owners Insurance Company of Lansing, Michigan.

Team GE Aviation
Flight Deck Lateral Map Display



Jason Ridgon, Jordan Clare, Cory Sites, Adam Dupler
Presented by Ron Simon of Auto-Owners Insurance

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 that engineers the software system that is the most technically challenging is recognized with the Chrysler Praxis Award, which is sponsored by Chrysler LLC of Auburn Hills, Michigan.

Team Boeing
XML Texture Composition



Jeremiah Cunningham, Jessica Parks, Marc Coleman, Jonathan Harris
Presented by Rick Rose of Chrysler

Design Day Judges

Michael Drazan
The Toro Company

Naim Falandino
Covisint

Vandy Johnson
Medtronic, Inc.

Rick Rose
Chrysler LLC

Karen Wrobel
Chrysler LLC

Richard Enbody
Michigan State University

Adam Haas
Ford

Kevin Ohl
Michigan State University

Damian Winslow
Dow Chemical

Urban Science 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 is recognized with the Urban Science Sigma Award, which is sponsored by Urban Science of Detroit, Michigan.

Team Motorola
Mobile User Generated Video Service



Kurt Seippel, Robert Gaul, Jonathan Szykowski, Brandon Malicoat
Presented by Randy Berlin and Mark Colosimo of Urban Science

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 6 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.

Team Medtronic
Mobile Health Management System



Michael Keesey, Kevin Chen, Karthik Chokkaram, Meghan McNeil
Presented by Dean Craven of TechSmith



TO SEE CHEMISTRY THROUGH THE EYES OF

HUMANITY IS TO SEE THE PROMISE OF A BETTER

FUTURE. That's the power of the Human



Element. The Dow Chemical Company proudly

supports MSU College of Engineering's Design

Day and the hope for the future it represents.



Prof. Shanblatt

ELECTRICAL AND COMPUTER ENGINEERING PROJECTS

PRESENTATION SCHEDULE — Lake Huron Room

Course Coordinator: Professor Michael Shanblatt

Faculty Advisors: Professors Aslam, McGough, Mukkamala, Peng and Strangas

Huron

8:30 – 11:30
Third Floor
Lake Huron Room

ECE 480 Electrical & Computer Engineering Projects

Time	Project Sponsor(s)	Sponsor Representative(s)	Faculty Facilitator(s)	Project Title
8:30 ECE 480	MSU RCPD	S. Blosser	R. McGough	Accessible Smart Grid Ready Wheelchair Battery Charger
9:00 ECE 480	MSU RCPD	S. Blosser	F. Peng	Accessible Manufacturing Equipment, Phase 2
9:30 ECE 480	Xilinx Corporation	P. Zoratti	R. Mukkamala	FPGA Implementation of Driver Assistance Camera Algorithms
10:00 Break				
10:30 ECE 480	Texas Instruments, Inc.	T. Adcock	E. Strangas	DC Motor Control Card
11:00 ECE 480	Hyundai Kia America Technical Center (HATCI)	M. Gava	D. Aslam	Automobile Headlamp Switching Using Smart Glass

ECE 480 Senior Capstone Design

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 MSU Resource Center for Persons with Disabilities, Texas Instruments, Xilinx Corporation, Hyundai-Kia American Technical Center

Accessible Smart Grid Ready Wheelchair Battery Charger

Team one's project entailed the design and construction of a smart grid ready, accessible wheel chair charging device. The device will benefit consumers by optimizing charging cycles to occur primarily during "off-peak" hours when electricity costs are lower. Additionally this device will feature accessible technologies to allow for ease of use by those who are disabled or otherwise impaired. While energy savings and "going green" are becoming more prevalent in today's world, the burden of manually starting and stopping charging cycles can prove too much for some. Our charging optimizer will allow users to simply enter the desired charge completion time and walk away leaving the charger to handle charging optimization autonomously.

The charging optimizer will communicate with a household smart meter to receive data about charging times, energy rates, and grid load. Using this information the charging optimizer calibrates itself to charge only when energy is least expensive as well as to complete charging as quickly as possible.

In addition to this functionality, the charging optimizer features an easy-to-use accessible interface designed especially for those with physical limitations. Sight, sound, and motor skills deficiencies are all addressed by the interface design.

As an added bonus our project will be going to Jim Renuk an MSU employee who struggles with cerebral palsy. This device will help Jim save money each month on his electric bill and will guarantee that his chair is always charged when he needs it.

<http://www.egr.msu.edu/classes/ece480/capstone/fall10/group01/>



B. Boozer
Electrical Eng.



M. Waligorski
Electrical Eng.



K. Jackson
Computer Eng.



C. Payne
Electrical Eng.



A. Humphreys
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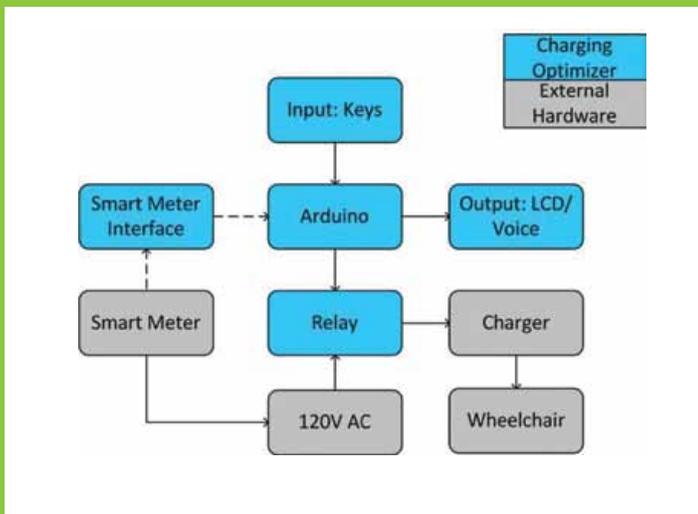
RCPD
Maximizing Ability & Opportunity



Mr. Blosser



Dr. McGough



Project Sponsor
MSU Resource
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Disabilities

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Manager

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Keith Jackson
Documentation Prep

Colin Payne
Presentation Prep

Matt Waligorski
Lab Coordinator

Accessible Manufacturing Equipment Phase 2

Our design team is being sponsored by the MSU Resource Center for Persons with Disabilities (RCPD). We have reengineered an accessible manufacturing device, originally created by another capstone design team in the fall of 2008. This machine was designed to cut pleated ribbon to length and to be operated by someone with cognitive and visual disabilities. The machine will be deployed at a company called Lettuce Duit located in Galien, MI, where the cut ribbons are used to construct prize ribbons.

Our team improved this machine by making it more robust, easier to maintain, and faster at cutting ribbons. We also added variable speed control, to allow the machine to run faster or slower as required. We eliminated previous motor overheating issues. We redesigned the interface and control systems to be compatible with LEGO MINDSTORMS NXT. This allows the machine to be reprogrammed by high school LEGO Robotics club students near where the machine will be deployed. We also added a variety of small improvements to reduce the time it takes to cut the ribbon as well as prevent the ribbon from catching on the machine.

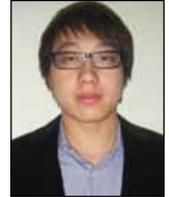
<http://www.egr.msu.edu/classes/ece480/capstone/fall10/group02/>



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Electrical Eng.



R. Prewett
Electrical Eng.



L. Tian
Electrical Eng.



N. Neumann
Electrical Eng.



J. Brouker
Electrical Eng.



RCPD
*Maximizing
Ability & Opportunity*



Mr. Blosser



Dr. Peng



Project Sponsor
*MSU Resource Center
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Disabilities*

**Sponsor
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Li Tian
Lab Coordinator

Xilinx: FPGA Implementation of Driver Assistance Camera Algorithms

Passenger safety is the primary concern and focus of automobile manufacturers today. In addition to the passive safety equipment, including seatbelts and primary airbags, technology based active safety mechanisms are being incorporated more than ever and may be soon required by law. Current trends are requiring automobile manufacturers to include a multitude of technology based safety equipment including ultrasonic sensors and back-up cameras. Historically, back-up cameras in vehicles give the driver an unaltered view from behind the vehicle; however, with the sponsorship of Xilinx, Michigan State University's ECE 480 Team 3 has designed and implemented an algorithm that will visually alert the driver to objects seen in the back-up camera.

This platform draws the driver's attention to objects both stationary and in-motion behind the vehicle by marking them with targets. In doing so, the driver will be less likely to overlook objects that may create a safety hazard. The team has combined knowledge of edge detection, object detection, and image clarity algorithms to create a system that will both accurately and efficiently detect and visually alert the driver to objects behind the vehicle. Implementation of the algorithm utilizes Xilinx's Spartan-3A Field Programmable Gate Array (FPGA) development board and Xilinx's System Generator tools.



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Electrical Eng.



C. Eckles
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E. Kuhn
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<http://www.egr.msu.edu/classes/ece480/capstone/fall10/group03/>



Dr. Mukkamala



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Tom Ganley
Rover

Texas Instruments: DC Motor Control Card

The goal of our project is to develop a motor control card and supporting software using technology provided by Texas Instruments. Texas Instruments had already designed a motor control card and software utilizing the C2000 family of 32-bit microprocessors. Our task was to adapt this existing design to make use of the MSP430 family of 16-bit microprocessors. This was a challenge because the software conventions and protocols as well as hardware footprint are significantly different between the two families.

The project required us to design a motor control card exactly to specifications. The MSP430 microcontroller interfaces with TI's DRV8412 motor driver card through a Dual Inline Memory Module slot. This plug-and-play DIMM protocol allows for the motor to be driven by completely different architectures without requiring redundant design. Although we worked to maintain equivalent functionality, we also worked to take advantages of the difference between the MSP430 and the C2000. One of the main motivations for the use of the MSP430 is its extremely low power consumption. In fact, MSP430s can run off of just the acidity of grapes.

After this card was created, software was created for controlling both brushed DC motors and stepper motors. The software is capable both of simple motor spinning operations as well as advanced control using current feedback.

<http://www.egr.msu.edu/classes/ece480/capstone/fall10/group04>



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M. Worden
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R. Dong
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Dr. Strangas



Project Sponsors

Texas Instruments

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Hyundai-Kia America Technical Center: Automobile Headlamp Switching Using Smart Glass

Team 5 has been charged with determining how to use smart glass to switch an automobile’s high beams on and off. “Smart glass” is a generic term describing types of glass which, when electrically stimulated, can change between opaque and clear states, which absorb or transmit light, respectively. Currently, cars that use HID headlamps rely on a mechanical system where a solenoid moves a metal shield into the path of the light, physically blocking the “high” portion of the beam. This mechanism is not ideal because it lacks flexibility and requires manufacturers to fabricate and install different headlamps to satisfy the requirements for left- and right-side headlamps, and the different American and European standards for beam patterns. Replacing the metal shield with a smart glass panel would overcome these disadvantages and allow the manufacturer to come another step closer to building a “world car” for the global market.

In addition to the advantage to the manufacturer, the use of smart glass in controlling headlamp beam patterns also has the potential to inexpensively implement several advanced headlamp technologies, such as mid-range beams and auto-leveling, features currently available only in high-end vehicles, that make nighttime driving safer.

Our team was faced with the challenge of finding which of several smart glass technologies could best meet the application requirements of fast switching-time, adequate light transmission, and resistance to shock and high temperatures. We also had to determine how to best mitigate the heat that builds up inside of a sealed headlamp assembly, which if unchecked could destroy the smart glass layer.



E. Martin
Electrical Eng.



K. Lee
Computer Eng.



S. Gotch
Electrical Eng.



B. Greetis
Electrical Eng.



R. Austin
Computer Eng.



H. Song
Electrical Eng.



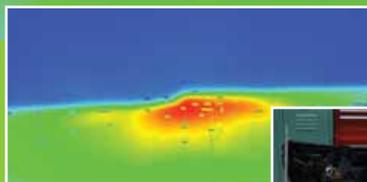
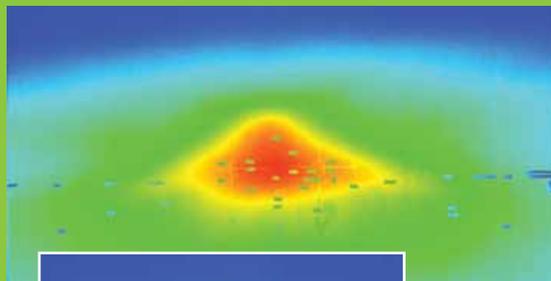
<http://www.egr.msu.edu/classes/ece480/capstone/fall10/group05/>



Mr. Gava



Dr. Aslam



Project Sponsor
*Hyundai-Kia
America Technical
Center*

**Sponsor
Representative**
Mr. Michael Gava

**Faculty
Facilitator**
Dr. Dean Aslam

**Team Members
& Non-Technical Roles**

Shawn Gotch
Manager

Kang Hun Lee
Webmaster

Edgar Martin
*Documentation
Prep*

Heejin Song
Presentation Prep

Brian Greetis
Lab Coordinator

Robert Austin
Rover

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Design Day Awards:

MICHIGAN STATE UNIVERSITY COLLEGE OF ENGINEERING

Electrical & Computer Engineering Prism VentureWorks Prize & Winners, Spring 2010

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, for example) 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.

Prism VentureWorks First Prize: Capacitive Rain Sensor for Automatic Wiper Control (Sponsor: Hyundai Kia America Technical Center (HATCI))



LEFT TO RIGHT:
Ishaan Sandhu, Arslan Qaiser, Anuar Tazabekov,
Dong-Ho Kang, Eric Otte, Dr. Michael Shanblatt

Prism VentureWorks Second Prize: Time-Sharing Computer System with Audio Integration (Sponsor: George & Vickie Rock and Dow Chemical)



LEFT TO RIGHT:
Andrew Bruinsma, David Wilson, Tim Haynie, Bret Charboneau,
William Mattingly, Dr. Michael Shanblatt

Prism VentureWorks Third Prize : Connect-On-Demand Satellite Link for Tanzanian Schools (Sponsor: George & Vickie Rock and Dow Chemical)



LEFT TO RIGHT:
Michael Moulton, Joseph Paul Larson, Rafael Ocampo,
Rodney Singleton II, Eric Hatch, Louis Garcia, Dr. Michael Shanblatt

Design Day Awards:

MICHIGAN STATE UNIVERSITY COLLEGE OF ENGINEERING

Professor's Choice Award and Winner, Spring 2010

The Professor's Choice Award (\$1,000 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.

Roadtrailer Air Brake Fault Locator (Sponsor: Triple Crown Services)



LEFT TO RIGHT:
Saurav Shrestha, Dilo Benjamin, Abdulaziz Najm, Tia Twigg,
Marcelo de Castro, Dr. Michael Shanblatt

Electrical & Computer Engineering Capstone Poster Award & Winner, Spring 2010

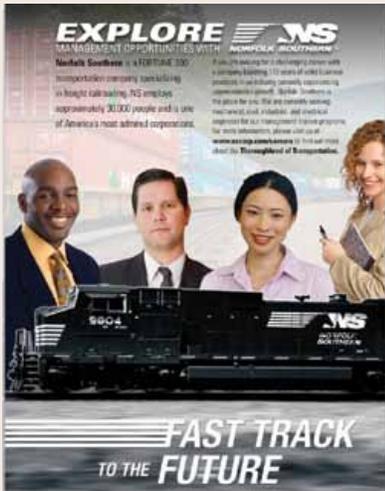
Each team in ECE 480, Senior Capstone Design, exhibits a poster and the items they have built during the semester and answers questions, from 8:00am-noon in the Union Ballroom. Judging of the best poster/demo is done by the groups of high school students participating in Design Day, based on their appeal and effectiveness in communicating the project goals and achievements. A prize of \$1000 is awarded to the most outstanding team.

Small, Lightweight Speed/Distance Sensor for Skiers/Snowboarders (Sponsor: Air Force Research Laboratory)

LEFT TO RIGHT:
Timothy Ross, Temika Cage, Benjamin Guild,
Justin W. T. Erksine, Dr. Michael Shanblatt
(missing: Kunaal Verma)



THANKS TO NORFOLK SOUTHERN



The Department of Electrical and Computer Engineering thanks Norfolk Southern for its generous financial support of Design Day. This support sponsored a design team, with their Triple Crown Services, and 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.



aeemsu.com

audio enthusiasts and engineers

Design Day:
December 10, 2010
8 a.m. until 1 p.m.

Second Floor Concourse:
Come hear and see all that we have done this semester.

OUR HISTORY:

Fall of 2006 a small group of engineers founding Audio Enthusiasts and Engineers, an organization open to all Michigan State University students. The first semester AEE designed and built their first masterpiece 'Revolution Audio', a stereo system engineered to produce true stereo sound regardless of which direction the listener is facing. AEE has become one of the most active student organizations in the College of Engineering. Its members are devoted to understanding audio concepts, as well as finding inventive ways to implement this knowledge. aeemsu@gmail.com



THEREMIN

Building a Theremin has shown how specialized oscillating circuits using the heterodyning principal can be used to create some very unique audio devices.



GUITAR PEDALS

Along with our Tube Amps a team built an assortment of Guitar Pedals. Members of this team learned research skills and how to use schematics and a soldering iron.



MOLDED EARBUDS

This team has been working to design and build in-ear headphones with mics on the outside to capture and listen to sound exactly as someone would live. Our members have learned valuable skills in research and development.



TUBE AMPS

This semester the Tube Amp Team built a variety of guitar amplifiers. Those involved in the Tube Amp Team quickly become knowledgeable about reading schematics, component layout, grounding and especially soldering.

Mechanical Engineering Design Program

ME Projects

Mechanical engineers make the world move and provide the energy to do this.

The goal of the mechanical engineering program at MSU is to graduate engineers that are prepared to **Lead, Create, and Innovate** in their professional careers.

The MSU Mechanical Engineering Design Program is the key element of the curriculum to achieve this goal. The five required design courses in the program provide the students with eight hands-on team-based design, build, test projects, six written communication experiences, three oral presentation experiences, and three poster presentation experiences. It is the Mechanical Engineering Design Program that distinguishes the ME program nationally and makes it one of the elite programs in the world.

The Mechanical Engineering Design Program would like to thank our Edison judges and their companies for their commitment to our design program.

Terry Cook, Shell Oil Company
Ann L. McCormick, Newcomb, Anderson, McCormick Energy Engineering and Consulting
Asif Nasar, The Boeing Company
Neil Wright, Department of Mechanical Engineering, Michigan State University
Brian Santhany, Dow
Jim Wilde, Beijing West Industries Co. Ltd.

Beijing West Industries Co. Ltd.



The Design Program would also like to thank Shell Oil for its continued generous financial support.

Design Day Awards:

MICHIGAN STATE UNIVERSITY 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: Dr. Craig Somerton, Alexandre Oliveira, Eric Tauzer, Fernando Oliveira, Joao Goncalves

SPRING 2010 ME 481 EDISON UNDERGRADUATE DESIGN AWARDS

First Place

Joao Goncalves
Alexandre Oliveira
Fernando Oliveira
Eric Tauzer

Second Place

Mohanad Bahshawn
Brandon Kelly
Benjamin Lindstrom
Jeremy Zalud

Third Place

Derek Baker
Derek Baker
Thomas Michalik
Kyle Scicluna

ME 481 Oral Presentation Award

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

SPRING 2010 ME 481 ORAL PRESENTATION AWARDS

First Place

Ricardo Demajo
Mirsena Lekovic
Florian Pribaldi
James Yizze



l-r: Dr. Craig Somerton, Florian Pribadi, James Yizze, Ricardo DeMajo, Mirsena Lekovic

ME 481 Outstanding Poster Award

The ME 481 Outstanding Poster Award recognizes the best poster presented by an ME 481 design project team as judged by a team of individuals from industry and academia. Judging is based on both technical content and aesthetic layout.

FALL 2009 ME 481 POSTER PRESENTATION AWARD

First Place

Sparrow Pediatric Rehabilitation Center: Pediatric Exercise Equipment
Christopher Cater
Kunjan Patel
Kelly Peterson
Eva Reiter



l-r: Dr. Craig Somerton, Benjamin Lindstrom, Jeremy Zalud, Mohammed Bahshawn, Brandon Kelly

Design Day Awards:

MICHIGAN STATE UNIVERSITY COLLEGE OF ENGINEERING

ME 471 Machine Design Award

The student team members winning the ME 471 competition at Design Day are recognized with the Machine Design Award. 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.



l-r: Charles Mc Govern, Nicholas Dallapiazza, Jeongseop Lee, Trevor Betz, Dr. Scott Keifer

SPRING 2010 ME 471 MECHANICAL DESIGN AWARD

First Place

Trevor Betz
Nicholas Dallapiazza
Jeongseop Lee
Charles McGovern

ME 412 Heat Transfer Laboratory 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.



l-r: Justin Meeder, Dr. Laura Genik, Joao Goncalves, Eric Tauzer

SPRING 2010 ME 412 HEAT TRANSFER DESIGN AWARD

First Overall

Joao Paulo Goncalves
Justin Meeder
Eric Tauzer

Second Overall

Drew Darling
Kenneth Eschbach
Admir Trnjanin

Lowest

Temperature
Lucas Fratta
Matthew Pung
Diana Toan

ME 371 Mechanical Design I Kids' Choice Award

The precollege students participating in Design Day vote for the most outstanding ME 371 project. The winning team is designated as the Kids' 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.



l-r: Dr. Brian Thompson, Michael O'Brien, Alexander Danaj, Sarah Stoner, Nicholas Righetti

SPRING 2010 ME 371 KIDS' CHOICE AWARD

First Place

Alexander Danaj
Michael O'Brien
Nicholas Righetti
Sarah Stoner

ME 371

9:00 – Noon
Second Floor
Parlor A & B



THRILLS FOR PRE-COLLEGIATES: MECHANISMS THAT FASCINATE, CAPTIVATE, STIMULATE AND ENTICE

INSTRUCTORS: Professor Farhang Pourboghrat
and Professor Brian Thompson

PROBLEM STATEMENT

Teams of students were required to design and manufacture mechanisms that would thrill an audience of pre-collegiate students. The only constraints imposed upon the assignment were that each mechanism must incorporate at least one linkage, one gear set and one cam-follower combination. These engineering marvels will be displayed along with a complementary poster explaining the subtleties of each mechanism, and each device will be demonstrated to the eager audience. Every ME 371 team will be interviewed by the pre-collegiate students who will assign points to each MSU team. Subsequently these points will be tallied and the winning team awarded the *Spartan Plaque* for creating the most thrilling mechanism. This inspiring plaque was designed and fabricated by students at Holt Junior High School more than a decade ago.

Teams and members

Team 1	Team 2	Team 3	Team 4
Jeffrey Klegon	Kenneth Bowman	Scott Hall	Katherine Hilton
Matthew Malek	Andrew Cooper	Hansen Ma	Kyle Justus
Peter Schultz	Matthew Lempke	Yue Shi	Yirang Liu
	Shawn Wright	Brian White	Yingxu Wang
Team 5	Team 6	Team 7	Team 8
Eric Beatham	Marta Jasyk	Christopher Chorny	Matthew Fisher
Anthony Han	Nur Joned	Tyler Jaynes	Sarah Haas
Jeffrey Narkis	Tim Polom	Andrew Nuttall	Andrew Putz
Michael Skierski	Jiawei Qin	Josh Racalla	Andrew Stuckwisch

Section 2

Team 1	Team 2	Team 3	Team 4	Team 5
Kellen Fitzpatrick	Josh Baack	Erik Durfee	Khalifa Al Mansouri	Robert Conley
Kurt Northrop	Rachel Bogle	Sam Goodsitt	Nilutpol Basumatari	Brandon Gandy
Joseph Ray	Rob Mishkin	Joshua Talaga	Werner Dahm	Camille McCall
Brian Tew	Mark Shuptar		Paul Jurcak	
Team 6	Team 7	Team 8	Team 9	Team 10
Scott Coy	Sarah Chrustowski	Bobby Fuentes	Gerald Gentz	Peter Koenigs knecht
Kyle Crayne	Austin Deneff	Brandon Miller	Ahra Ko	Matt Pawlicki
Adam Sajdak	Taryn Klinkner	Thomas Vacketta	Ben Luedeman	Seth Wald
Greg Tenbusch	Ryan Sanback	Doug Van Meter	Greg Thomas	Nick Wilson



ENHANCEMENT OF ELECTRONIC COOLING

INSTRUCTOR: Dr. Laura J. Genik

TA Staff: Chad Glinsky, Christopher Paul

Computers are all around us and have really become an integral part of our daily lives. We interact with microprocessors when we use our microwave oven, start and then drive our cars, even when we are just sitting in the old recliner watching television. Microprocessors are an essential feature in the enhanced global competitiveness of American manufacturing. One of the critical factors in the continued development and utilization of microprocessors is the maintenance of operating temperatures to acceptable levels. Being electronic devices, microprocessors will produce heat due to Joule heating that must be dissipated. The ME 412 design project will look at efficient ways of enhancing the heat transfer from an electrically heated plate.

PROBLEM STATEMENT

The project team is to design, analyze, build and test a heat transfer device to minimize the operating temperature in the center of the upward facing side of an electrically heated plate. The electrically heated plate is composed of a flexible heater sandwiched between two thin metal plates. The plate is of dimensions 2” by 3” and approximately 17 Watts of electric power will be applied. The plate must be maintained in a horizontal position. A box fan that will provide an air flow within a specified velocity range will be used to augment the heat transfer. The heat transfer device may be placed no closer than one foot in front of the fan. The device must also include any supporting structure needed to suspend the heated plate in the air flow. The objective will be to minimize the operating temperature of the plate, subject to cost and weight considerations. The device will be judged on the basis of the center surface temperature, the mass of the device, and its cost. The device, including any supporting structure, must fit inside a box of dimension 14” x 14” x 12”.

TIME	STATION	DESIGN TEAM
9:00 am	A	Christopher Lange, Curtis Mumaw, Christopher Rawsky
9:00 am	B	Jeffrey Vanandel, Nicholas Zhu
9:15 am	A	Alexander Douglass, Jeffrey Holley, John Schultz
9:15 am	B	Nicholas Dallapiazza, Andrew Harbin, David Parke
9:30 am	A	Hassan Alzayer, Andrew Nolan, Evan Racine
9:30 am	B	Neil Jessel, Mollie Montague, Peter Strom
9:45 am	A	Adam Blumerich, Garrett Kerns, Joseph Rotellini
9:45 am	B	Darren Fung, Courtney MacDonald, Daniel Tepe
10:00 am	A	Mark Goldy, David Kempf, Ross Loynes
10:00 am	B	Rachel Jacquin, Caroline Skuta, Andrew Vanderklok
10:15 am	A	Alex Gage, Motozo Horikawa, Justin Ward
10:15 am	B	Michael Magner, Benjamin Nutsch, Peter Redente
10:30 am	A	Andrew Chiesa, Logan Larson
10:30 am	B	Mark Holmes, Bradley Legris, Nicholas Lehman

ME 456

9:10 – 10:50
Third Floor
Lake Erie



PROTOTYPES OF COMMERCIAL PRODUCTS

INSTRUCTOR: Professor Clark Radcliffe

TA Staff: Matt Ryerkerk

PROBLEM STATEMENT

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
1	9:10	Kyle Bateman, Trevor Deland, Katelin Friederichs, Darren Fung
2	9:30	Trevor Betz, Ashley Kulczycki, Jeongseop Lee, Amar Shah
3	9:50	Abdus Agha, Mark DeKleine, Nathan Geib, Alexander Suradja
4	10:10	Stefan Brockmann, Andrew Nolan, David Parke, Sarah Stoner
5	10:30	Michael Fetter, Brandon Gray, Mollie Montague, Peter Strom





APPLE JUICE EXTRACTOR

INSTRUCTOR: Scott Kiefer

PROBLEM STATEMENT

Students in ME 471 were challenged to design and build a prototype apparatus for extracting juice from apples. The students were given a lot of freedom as to how their designs could function, but they did have to adhere to a few customer constraints as follows:

- a. the device may be freestanding or may be attached to a standard table, but no permanent damage may be done to the table;
- b. one person must set up and operate the device alone;
- c. the mechanism used to extract the juice must be human powered;
- d. the apple juice that is extracted should have very little particulate matter;
- e. the juice that is extracted from the apples must be good for human consumption (any surface that touches the apples or the juice must be able to be sanitized in a standard kitchen sink);
- f. a removable container must be included to collect the extracted juice;
- g. the time it takes to extract the juice from 8-10 apples must be under 10 minutes;
- h. the operator will be allowed to prepare (slice, core, peel, etc.) apples before putting them into the juice-extracting device using standard kitchen utensils.

The devices will be judged with respect to the amount of juice the device can extract, the appearance of the device (aesthetics and design impression), the amount of storage space the device requires when not in use, and the total weight of the device.

TIME	STATION	DESIGN TEAM
9:00 am	A	Sami Agha, Kevin Campau, Dustin Colthore, Adam Rainbolt
9:00 am	B	Pete Anthony, Sachih Golhar, Adi Kosgi, Mike Wong
9:12 am	A	Brandon Gray, Rachel Maurer, Nick Mimikos, Chad Payne
9:12 am	B	Dave Kempf, Daniel Maniscalco, Adam Nelligan, Alex Tollis
9:24 am	A	Mike Fetter, Brian Gilkey, Michael Thoel, Stephanie Vasi
9:24 am	B	Alex Danaj, Mike O'Brien, Nick Righetti, Sarah Stoner
9:36 am	A	Matthew Flis, Jordan Smart, Fernando Vasquez, Bryan Walega
9:36 am	A	Brent Ewald, Justin Freeman, Zael Sprinkle, J.T. Whitman
9:48 am	A	Andre Chanyawatanchel, Evan Koleda, David Marsh, Blake Wilmore
9:48 am	B	John Chancey, Kyle Kocarek, Eric Massa, Justin Raymond
10:00 am	A	Nichole Kramer, Kyle Spiekermann, Cory Waltz, Sara Wiekeroeder
10:00 am	B	Kelly Burke, Hillary Gregory, Stephen Santavicca, Kristin Steinmetz
10:12am	A	Trevor DeLand, Jelena Paripovic, Jeremy Racine, Brian Rockwell

ME 481

8:00 – 11:45
Third Floor
Lake Superior Room



Prof. Radcliffe

MECHANICAL ENGINEERING PROJECTS

PRESENTATION SCHEDULE — Lake Superior and Tower Rooms

Course Coordinator: Professor Clark Radcliffe

Faculty Advisors: Professors Averill, Bénard, Mukherjee, Patterson, Shaw

Lake Superior Room

Time	Project Sponsor(s)	Professional Advisor(s)	Faculty Advisor (s)	Project Title
8:00	Shell Oil Company Burcham Hills Retirement Community	J. Layne	R. Mukherjee	Moveable “Grab Bar” for Senior Apartments
8:25	American Hydromech	T. Droste	A. Bénard	Fluid Power Application of a Regenerative Turbine Pump
8:50	Eaton Corporation	U. Farooq B. Said	S. Shaw	Analysis of Magnetic Properties of an Electro- Hydraulic Servo Valve
9:15	Level 11 Physical Therapy Shell Oil Company	B. Thornton	R. Averill	All Terrain Ambulation and Crawling Body Weight Support System
9:40–10:00 Break				
10:05	Ford Motor Company	R. Ford T. Smith F. Valencia	R. Averill	Structural Sealing Flange for Thermoplastic Powertrain Components
10:30	Whirlpool Corporation	N. Giacomini U. Mathur P. Setubal	R. Mukherjee	LED Panel Optimization and Attachment on an Appliance
10:55	Whirlpool Corporation	G. Horton C. Maas U. Mathur	A. Bénard	Non-plumbed Manual Pump Water System for an Appliance
11:20	Motorola Mobility	J. Wojack	E. Patterson	Mobile Device with a Pico Projector

ME 481 Mechanical Engineering Design Projects

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 American Hydromech, Burcham Hills Retirement Community, Eaton Corporation, Ford Motor Company, Level 11 Physical Therapy, Motorola, Motorola Foundation, MSU Department of Mechanical Engineering, Shell Oil Company, and Whirlpool Corporation

Burcham Hills Retirement Community: Moveable “Grab Bar” for Senior Apartments

Burcham Hills is a not-for-profit retirement community home that was built in 1974. It is dedicated to providing quality care for residents even as their needs become increasingly demanding. Burcham Hills is home to many residents with various levels of need and does its best to ensure the happiness of its residents by allowing them to rearrange their living quarters to their preference.

Burcham Hills has a rehabilitation and health center whose primary goal is to aid in the healing and recovery process of residents and return them to their former level of health and wellbeing as quickly as possible. Burcham Hills is licensed with a Skilled Nursing Facility staff that provides physical, occupational, speech, and recreational therapy.

Currently, caregivers assist residents attempting to move from a seated position to a standing one. This transfer method tends to cause back injuries to caregivers. Also, because there are a limited number of caregivers, residents end up sitting for long periods of time, resulting in bedsores and further deterioration of muscles and motivation. Assisting the seniors in becoming more self-sufficient will improve their lives at Burcham Hills.

A moveable grab-bar that is accessible anywhere in the room will help residents gain independence, prevent bedsores, and reduce the threat of back injuries to caregivers. Research was performed on materials, manufacturing processes, and geometries; and the most effective design was chosen. Computer-aided design programs were then used to model parts and subject them to stress analysis testing. Meeting constraints such as mechanical loading, versatility, maintenance procedures, manufacturability, aesthetics, and cost was essential to the success of the project.

...*The Burcham Hills Retirement Community Student Design Team*



Mr. Layne



Prof. Mukherjee

When working with the elderly, eventually it becomes hard for them to get up from their recliner or wheelchair without assistance. Once this happens then most of the lifting and moving is done by the caregivers or mechanically by a resident lift. At this point it becomes difficult for the resident to maintain strength to help with standing and transferring. But if you provide these people 2 vertical grab bars or a horizontal and a vertical grab bar you will find that they can still stand with their own strength with only guidance from the caregivers. Providing a stable yet moveable grab bar allows them to stand from a bed or a recliner even if is in the middle of the room. This allows them to be independent for longer, creates less demanding lifting for the caregivers, and provides a creative approach to accessibility for an older building.

Joel R. Layne
Occupational Therapy
Burcham Hills Retirement Community

Project Sponsor
Burcham Hills
Retirement Community
East Lansing, Michigan

Shell Oil Company
Houston, Texas

Professional Advisor
Mr. Joel Layne

Faculty Advisor
Prof. Ranjan Mukherjee

Team Members and Home Towns
Nick Lehman
Columbus, Ohio

Mollie Montague
Dimondale, Michigan

TJ Qualman
Plainwell, Michigan

Peter Strom
Washington, Michigan

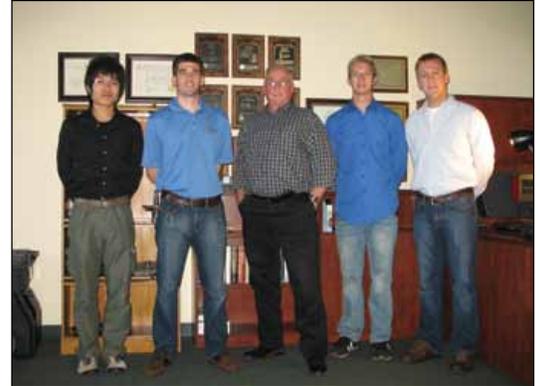
American Hydromech: Fluid Power Application of a Regenerative Turbine Pump

American Hydromech is a locally owned and operated Michigan business founded by Mr. Timothy A. Droste. American Hydromech specializes in contract and development engineering as well as equipment assembly for land and sea vehicle applications.

American Hydromech is involved with the development of a new means of powering automotive hydraulic pumps. Existing applications include the use of gear rotor pumps that have developed a reputation for an unpleasant audible noise. It has been shown in other fluid systems, most prominently fuel systems, that hydrodynamic (regenerative turbine) pumps have been successfully implemented. This project will investigate the feasibility of implementing a hydrodynamic pump at low pressure levels to reduce the overall audible noise level in fluid power pumps for automotive applications. In addition to reducing audible noise, the use of a regenerative turbine pump, in conjunction with an electric motor, will allow a greater flexibility of pump performance by making the pump drive independent of engine speed.

The student team was given the task of designing an appropriate fluid circuit system to test the feasibility of using a regenerative turbine pump in place of a standard gear rotor pump. CAD was used to design the fittings and other assembly components. Utilizing the pump test assembly, several parameters were tested including discharge pressure, pump efficiency, sound pressure, and system flow rate.

...*The American Hydromech Student Design Team*



Mr. Droste

Typical low pressure auxiliary fluid power pumps used in the automotive industry are based on conventional positive displacement machinery, i.e. fixed displacement gear-type rotors. These designs have found favor in cost and durability-sensitive applications but have developed a reputation for objectionable audible noise. There is experience in unrelated fluid systems, most notably fuel supply systems, where hydrodynamic pumps have been used with success. This project investigates the suitability of such machines in lower pressure fluid power applications.

Mr. Tim Droste
American Hydromech



Prof. Bénard

Project Sponsor
American Hydromech
Howell, Michigan

Professional Advisors
Mr. Tim Droste

Faculty Advisor
Prof. André Bénard

Team Members and Home Towns
Motozo Horikawa
Okemos, Michigan

Chris Lange
Midland, Michigan

Chris Rawsky
Brighton, Michigan

Oliver Zemanek
Freeland, Michigan

Eaton Corporation: Analysis of Magnetic Properties of an Electro-Hydraulic Servo Valve

Eaton Corporation is a global corporation specializing in powering business systems by manufacturing and distribution of electrical, hydraulic, and mechanical products. The branch of Eaton Corporation based in Jackson primarily manufactures hydraulic power systems. This includes the hydraulic cylinder together with the servo valves that control systems.

For a hydraulic system to perform with high precision, good performance of the servo valve is essential. The current model of servo valves has been manufactured for the past 30 years. However, Eaton Corporation has determined that this model does not perform as well as their competitor's product. This is due to potential issues in the materials, geometry, and tolerances of some of servo actuator components. The goal of this project is to research materials, machining processes, and tolerances in order to help improve the performance of Eaton's servo valve.

Our team proposed a number of design changes, based on the outcome of our investigations. These involved varying materials, geometry, and tolerances. The team designed and built a test rig for assessing how the proposed changes affect the response of the servo actuator. This rig measures and evaluates the response of the servo armature using Digital Imaging Correlation, and the results of the study will be used to recommend design changes for improving the performance of Eaton's servo valves.

.....*The Eaton Corporation Student Design Team*



Dr. Farooq



Mr. Said



Prof. Shaw

Servo valves are an integral component of electro-hydraulic technology in the Hydraulic segment of Eaton Corporation. These valves provide closed-loop control with exact positional accuracy, highly repeatable velocity profiles, and predictable force or torque regulation in a hydraulic system. With the completion of this project Eaton is anticipating improvements in quality, better component control, efficiency, and a higher production rate.

Dr. Umar Farooq
Eaton Corporation

Project Sponsors
Eaton Corporation
Jackson, Michigan

Professional Advisors
Dr. Umar Farooq
Mr. Bilal Said

Faculty Advisor
Prof. Steven Shaw

Team Members and Home Towns
Kenneth Eschabach
Lansing, Michigan

Evan Racine
Grand Blanc, Michigan

Caroline Skuta
Flint, Michigan

Andrew Vander Klok
Lowell, Michigan

Level 11 Physical Therapy: All Terrain Ambulation and Crawling Body Weight Support System

Level 11 is a leader in physical therapy rehabilitation to patients with neurological injuries. It is always seeking ways to improve the rehabilitation process while making the recovery more enjoyable and beneficial for the patients it treats. Level 11's Clinical Director, Bill Thornton, recently designed and patented a body harness that will be used to help patients suffering from paralysis of the legs to both crawl and walk. The problem is that there is not currently a system on the market that enables both crawling and walking.

The All-Terrain Ambulation and Crawling (ATAC) system will allow patients to either crawl or walk utilizing the new harness. ATAC is an overhead system that accommodates patients of various heights, weights, and strength levels to improve their recovery. This system is an inexpensive alternative to many overhead systems that can cost upwards of \$100,000. ATAC is a portable frame that can be utilized both indoors and outdoors. Combined with the body harness, ATAC provides patients anterior and posterior support while crawling and vertical support while walking. The system features the use of an electric hoist that makes the loading of patients easier and also provides the therapists the ability to quickly adjust how much support is being provided to the patient during use.

The design team built a prototype of ATAC. It features adjustable arm rests to provide upper body support for patients while walking. The frame design is open at two ends to allow easy access



of therapists to assist patients during use. The system was designed using a large factor of safety to ensure the protection and wellbeing of all users. ATAC was created to improve the rehabilitation process for both patients and therapists alike.

...Level 11 Student Design Team



Mr. Thornton

The ATAC therapeutic device allows for more efficient/efficacious rehabilitation of individuals who have encountered traumatic neurological pathologies throughout the entire clinical space. Specifically, the ATAC will allow for staff/patient safety in numerous enriched environments while performing aggressive physical/occupational rehabilitation during various levels of bodyweight support assistance.



Prof. Averill

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Ford Motor Company: Structural Sealing Flange for Thermoplastic Powertrain Components

Ford Motor Company is responsible for the building blocks of the automotive industry. From Ford's Model A creation in 1903, to the release of its latest 5.0 Liter Mustang in 2010, Ford Motor Company has proved it is one of the top automotive companies in the world today. Ford's striving for excellence in the automotive industry has allowed for new, innovative components for its vehicles each year.

Automotive component design is a competitive and challenging arena in the automotive industry. Automotive suppliers and OEM's are constantly investigating new innovative ideas and concepts that will increase the overall value of the vehicle to the customer. This project involved creating a new component design, specifically a thermoplastic valve cover sealing flange that could be used on new engine architectures, like the 5.0 Liter Ford Mustang engine.

The team was tasked to create a new sealing flange design that will not only enhance the look of the engine valve cover, but minimize the plastic and fastener usage, while keeping the necessary structural integrity under the gasket pressure.

Computer aided designs were created by the team members and stress analysis, both mathematical and finite element, was performed on each model. Optimization tools were used to



maximize the fastener span and minimize the wall thickness of each design to reach the goals set by Ford of decreasing weight and cost to produce a product of high value.

...*The Ford Motor Company Student Design Team*



Mr. Ford



Mr. Valencia



Mr. Smith



Prof. Averill

Automotive suppliers and OEM's are constantly investigating new innovative ideas and concepts that will increase the overall value of the vehicle to the customer. This project provided the MSU Capstone team with an opportunity to create a unique structural sealing flange design for thermoplastic powertrain components, specifically for engine valve covers. The proposed sealing flange design will increase component durability, improve component robustness, and increase the overall component value for Ford Motor Company.

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Whirlpool Corporation: LED Panel Optimization and Attachment on an Appliance

Whirlpool Corporation is a global leader in the manufacturing and marketing of major home appliances. Whirlpool is a customer-to-customer based company that develops the Whirlpool brand as well as other brands including Maytag, Jenn-Air, KitchenAid, Amana, Brastemp, Estate, and Acros. Through these brands Whirlpool Corporation manufactures appliances that include refrigeration, fabric care, garage organization, cooking, water filtration, and countertop appliances.

Currently, Whirlpool Corporation is focusing on basic LED Panel Illumination systems. These systems are facing problems related to light distribution since the LEDs create hotspots. These hotspots cause the inside of the appliance to lose its aesthetic appeal due to the unevenness of the light coming from the illuminated panel. LED Panel size and placement constraints are also emphasized. Therefore, Whirlpool Corporation enlisted the help of the mechanical engineering design team to focus on the LED Panel Illumination for the interior of a refrigerator.

The design team researched various LED technologies, performed analysis, and built prototypes to find the optimal solution. The main focus related to three important LED factors: power rating, number used, and placement. Through cooperation from Whirlpool Corporation, as well as the faculty advisor, a final design was achieved that optimized light distribution in the LED Panel Illumination module.

...*The Whirlpool Corporation Student Design Team*



Mr. Giacomini



Mr. Mathur



Mr. Setubal

Basic LED panel illumination systems face problems related to light distribution. The LEDs are so punctual light sources that hot spots can be seen where they are located. In some cases the unevenness of the light distribution is too big and, therefore, affects the overall aesthetical appeal of the appliance. The solutions the group develop would provide Whirlpool a good insight into solving this issue of overall aesthetic appeal that could potentially be applied to our appliances all across the world.

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Whirlpool Corporation: Non-plumbed Manual Pump Water System for an Appliance

Whirlpool Corporation is a worldwide leader in the design and implementation of appliances with a variety of cutting-edge features and technologies. In a growing global economy, the company understands the unique circumstances posed in each of its primary markets and seeks to optimize its designs to enable each of its customers to have access to the very best in product innovation and features.

Many regions of the world do not have the indoor plumbing infrastructure necessary to fully take advantage of all the features of many modern household appliances. The customers in burgeoning economies of countries like Brazil, Russia, India, and China would like to have access to all of the available conveniences from Whirlpool Corporation's products, including self-dispensing water and ice machines that are incorporated in many of the designs the company offers. In traditional refrigerator design, this feature is dependent on a connection to municipal water lines. It was the intention of Whirlpool Corporation in collaboration with the student design team to build a mechanically driven alternative that would allow the end-user access to the ice-and-water dispensing system without incurring significant added cost.

The team will document the design process and results of different pump setups during bench-top testing while recording the respective differences in flow-rate, pressure, overall reservoir capacity, and cost of



each system during feasibility studies. These results of each unique pump design will be furnished to Whirlpool Corporation's technical team to ascertain whether to follow up with appropriate integration efforts as they are marketed to consumers in the effected target demographic.

...The Whirlpool Corporation Student Design Team



Mr. Maas



Mr. Mathur



Prof. B nard



Mr. Horton

Many regions of the world do not have a water connection available for the refrigerator. This problem has been solved by some refrigeration manufacturers by incorporating water reservoirs that are filled by the user manually and the water is delivered to the icemaker and or dispenser by way of an electrically powered pump and electro-valve system. Although these solutions work very well, there are many regions in the world that cannot afford the cost of this approach. Whirlpool would like to solve this problem in a more cost effective manner by employing the use of manual pumps and pressure vessels to take the place of the electrical based solution.

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Motorola Mobility: Mobile Device with a Pico Projector

From its first product, the “Battery Eliminator” in 1928, to the latest generation of handheld mobile devices, Motorola has been a major contributor to the communications technology industry. In 1973 Motorola engineers developed the world’s first handheld cellular phone and has been a driver in mobile device innovation ever since. The mobile device market is a highly competitive field where the latest technology and consumer trends decide the success of a company. To maintain its position as a leading provider of mobile devices, Motorola continues to explore new technologies and how its products influence people’s everyday lives.

A vision into the future of communication technologies is what makes Motorola a pioneer in mobile devices. One vision is the implementation of pico projectors. Over the past decade, projectors have decreased in size and power requirement and have increased in image quality. As a result of these advances, Motorola is now on the verge of bringing a new user experience to the mobile market through the coupling of a mobile device with a pico projector. It is the goal of this project to develop a new and unique means of bringing portable projection to the communications market.

The team of students developed numerous concepts that were evaluated with required design parameters and consumer input. Market research was conducted to attain an understanding of how potential customers would receive our solutions. From this feedback, we developed a prototype. This prototype was then subject to refinement over the course of several design cycles, from which a final concept design emerged.

...The Motorola Student Design Team



Mr. Wojack

The development of projects aligns with Motorola’s ambition to develop compelling mobile devices that allow consumers to be more productive. The goal of these projects will be to create a new paradigm for a mobile phone experience.

Jason Wojack
Motorola Mobility



Prof. Patterson

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The only thing more
diverse than our products....
are the people who create them.

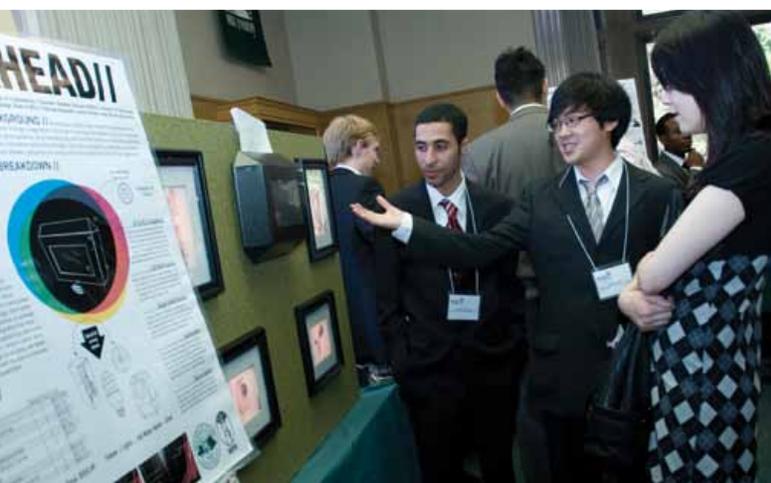


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