MICHIGAN STATE UNIVERSITY

The MSU College of Engineering

Spring 2011

Design Day

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

Auto-Owners Insurance
Life Home Car Business
The "No Problem" People®

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

April 29, 2011

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 displayed 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

Jeffrey F. Harrold
CEO

"Highest in Customer Satisfaction with the Auto Insurance Claims Experience"
- - J.D. Power and Associates

Program Page/Course Number Index Listing: April 29, 2011

Index continued on the next page

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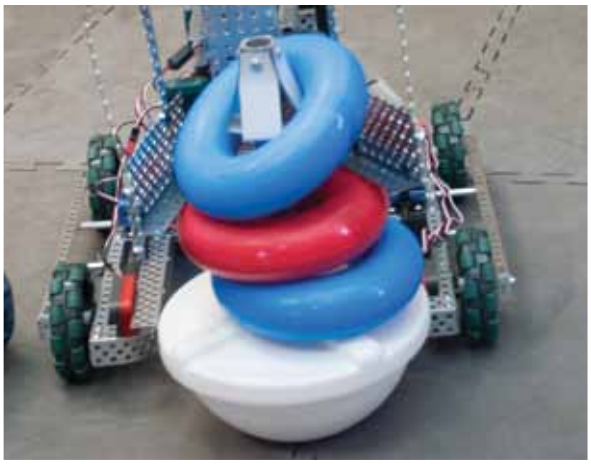


A note from the Design Day Director

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 Spring 2011 Design Day Executive Partner. As a Lansing based Fortune 500 company, Auto-Owners Insurance has a rich history of engagement with Michigan State University.

Joining the team this semester we welcome our Directing Partner Sponsor, GE. Known internationally for their work in aviation, healthcare, transportation and appliance and lighting, we appreciate their continued support of MSU's engineering disciplines.

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 175 middle school and junior 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.

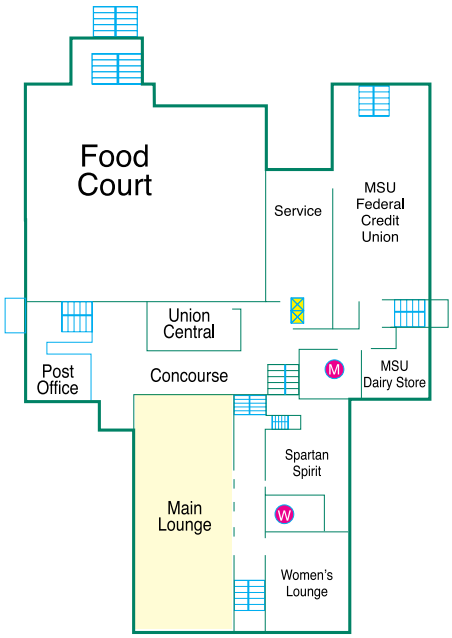
Design Day would not be possible without the continued support of our project sponsors who provide both funding and a professional experience for our capstone design teams.

Along with our Executive Partner, Auto-Owners Insurance, and Directing Partner, GE, we thank our Supporting Partners Dow Chemical Corporation, Medtronic, Michigan State Federal Credit Union, Whirlpool, and Norfolk Southern.

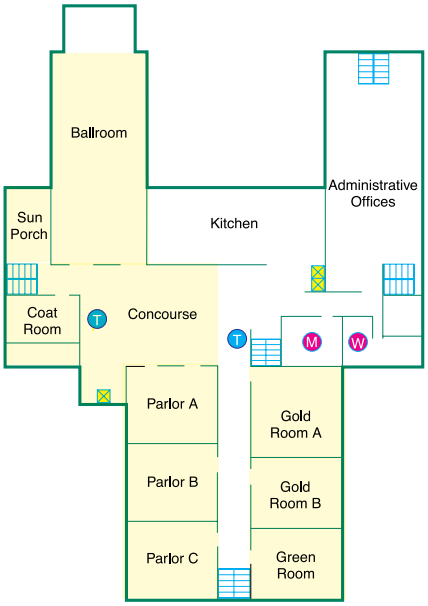
Please join us for the Design Day Awards ceremony in the Ballroom at 1:15 pm when we will honor all of our talented Spartans, the best of the best.

Sincerely,

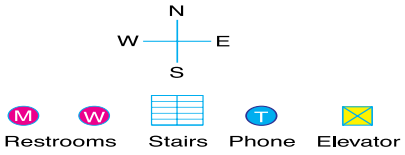
Maureen E. Blazer-Adams
Director, Design Day
MSU College of Engineering

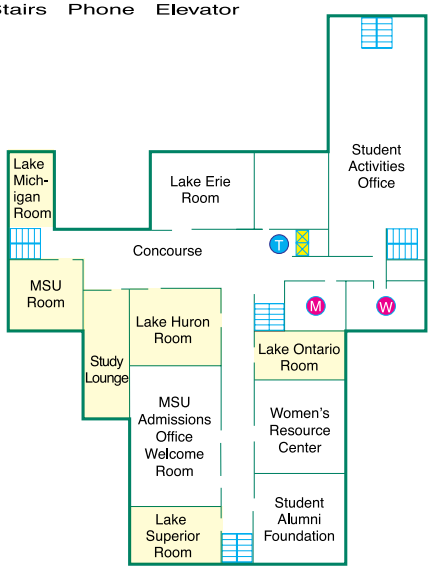


First Floor

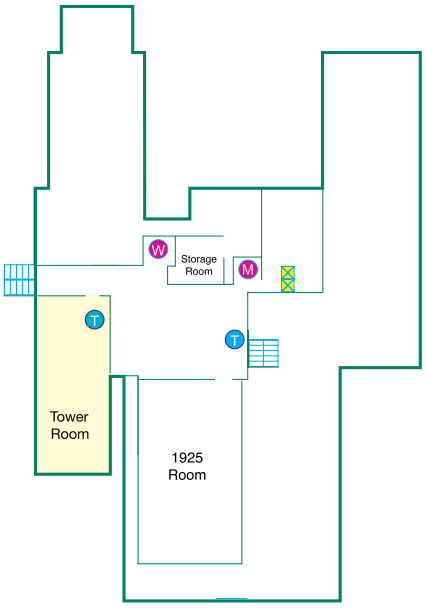


Second Floor





Third Floor



Fourth Floor

MSU Union Floor Plan

Design Day Events Schedule: Friday, April 29, 2011

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				
ECE 101 Introduction to Electrical and Computer Engineering	11:00 a.m.		2nd Floor Gold Room A 9:30 – 11:00 a.m.			
EGR 100 Presentations		Green Room 9:00 a.m. – Noon				
ME 371 Demonstrations		Parlor A 9:00 a.m. - Noon				
ME 412 Competition		2nd Floor Ballroom 9:00 a.m. - 11:20 a.m.				
ME 471 and ME 478 Competitions		2nd Floor Ballroom 9:00 a.m. - 11:00 a.m.				
CAPSTONE COURSES						
All Capstone Posters Including BE 485/487, ChE 434/491 and MSE 466	1st Floor Lounge 8:00 a.m. - Noon					
AES 410 Project Presentations	2nd Floor Gold Room B 7:45 a.m. - 11:30 a.m.					
CE 495 Project Presentations	Lake Michigan Room 8:00 a.m. - Noon					
CE 495 Project Presentations	MSU Room 8:00 a.m. - Noon					
CSE 498 Project Presentations	Lake Ontario Room 7:30 a.m. - 11:45 a.m.					
ECE 480 Project Presentations	Lake Huron Room 8:00 a.m. - Noon					
ME 481 Project Presentations	Tower Room 8:00 a.m. -Noon					
ME 481 Project Presentations	Lake Superior Room 8:00 a.m. -Noon					
LUNCH AND AWARDS						
MSU Lunch			2nd Floor Concourse 12:15 p.m. - 1:00 p.m.			
MSU Awards				Ballroom 1:15 p.m.- 2:00 p.m.		
School Awards			Ballroom Noon - 12:15 p.m.			
School Lunch			Parlor C 12:15p.m. - 1 p.m.			

KEY: AES event | CE event | CSE event | ECE event | EGR event | ME event | School event

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

Dart Day of Innovation and Creativity

for 7th-12th Grade Students

Our Future Lies in Some Very Precious Hands...

At the Dart Foundation, we are committed to developing scientifically literate students in Michigan. We're proud to sponsor the MSU College of Engineering Design Day for pre-collegiate students.

Funded by the Dart Foundation

DART FOUNDATION

MICHIGAN STATE UNIVERSITY | College of Engineering

The Dart Foundation Day for 7th-12th Grade Students

April 29, 2011

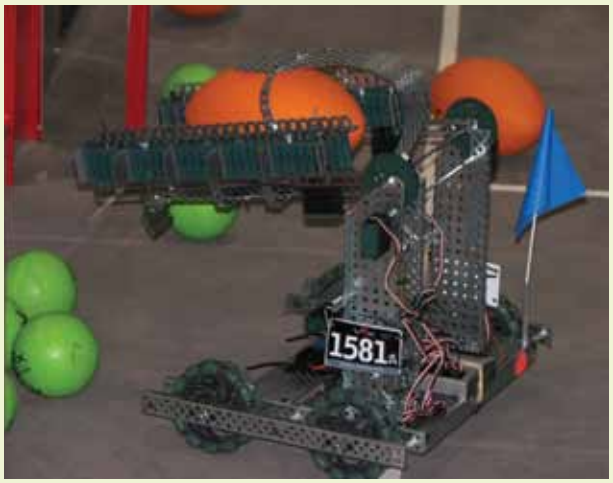
Precollege Student Voting: *During the morning on Design Day all visiting precollege students will be viewing Engineering Projects and voting.*

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/ project viewing, including Dr. Kwon's amphibious vehicle
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 students 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.

MEMBERS OF THE ORGANIZING COMMITTEE

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

Luis Donadoto
Assistant Director of MSU Engineering Recruitment and K-12 Outreach

Jamie Lynn Marks
MSU Engineering
Recruitment and K-12 Outreach

Russ Pline
Okemos High School and MSU Engineering
Recruitment and K-12 Outreach Design Day Coordinator

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

EGR 100

9:00 a.m. – Noon
Second Floor
Green Room

EGR 100 Introduction to Engineering Design

INTRODUCTION TO ENGINEERING DESIGN

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

TA STAFF: Wouter Brink, Sara Longanbach, Brad Rutledge, Marc Santa, Ryan Wood

MENTOR STAFF: Christina Barry, Elaine Belenky, Michael Conboy, Ryan DeBono, Mike Fetter, Jennifer Jury, Kyle Justus, Jeremy Racine, Landon Riker, Cory Snowdin, Diana Toan, Danielle Vasko

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. Nearly 350 students are enrolled in EGR 100 this semester.

For the final course project, the student teams selected from three project types: (i) solar water heater design, (ii) Lego Mindstorms competition, and (iii) MSU Resource Center for Persons with Disabilities (RCPD) design. For the first choice, the student teams were to design, build and test a solar water heater that would 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. The third project type had student teams work with RCPD clients to design and build working prototypes to assist the clients in daily activities.

Teams from each of the three project types will display their prototypes at Design Day along with a poster detailing their design concepts. Pre-college students will recognize the most outstanding projects with awards.


Dr. Buch


Dr. Choi


Dr. Grummon


Mr. Hinds


Dr. Marks


Dr. Sticklen


Dr. Stockman


Dr. Tan


Dr. Walton


Dr. Wolff

EGR 100 Outstanding Prototype and Poster Award

The EGR 100 Outstanding Poster and Prototype Award recognizes the best project presented by an EGR 100 design team as judged by area middle and high school students.

First Place Fall 2010
Megan Chorazyczewski
Lauren Hart
Jordan Martin
Lauren Moore
Andrew Rolling

aes Applied Engineering Sciences

AES

7:45 a.m. – 11:30 a.m.
Second Floor
Gold Room B

APPLIED ENGINEERING SCIENCES CAPSTONE PROJECTS

PRESENTATION SCHEDULE — Gold Room B

AES 410 Teaching Staff: Dr. Jon Sticklen, Director of AES

Mr. James D'Amico (right) and Mr. Justin Streen (left)

Time	Company	Project Title
7:45 a.m.	Greater Lansing Food Bank & Mid-Michigan Food Bank	Recommendations for Delivery Routes between Mid-Michigan Food Bank and Greater Lansing Food Bank
8:15 a.m.	Girl Scouts: Heart of Michigan Council	Recommendations for Outreach and Systematic Record Keeping for Girl Scouts Operation
8:45 a.m.	MSU Surplus Store	Recommendations for Enhancing Storage Capability and Visibility
9:15 a.m.	MSU CSLCE: Fill the Bus	Recommendations for Improved Marketing of the Fill the Bus Event
9:40 a.m.	Break	
10:00 a.m.	Indestructible Dog Toys	Recommendations for Lansing Web Sales Company to Develop Direct Link to Production
10:30 a.m.	XG Sciences - 2011	Marketing Analysis for XG Sciences - An MSU High Tech Spin Off Company
11:00 a.m.	Peckham Industries	Recommendations for Productivity Enhancement for Peckham Industries

EGR 410 AES Capstone Course
Senior Capstone Project

The AES capstone is the culmination of the entire program. The course covers content new to the students on professional ethics, project management methods, and concepts of six sigma methods. But the strong thrust of the program is the capstone project itself. The capstone project is…

- A project from industry or non-profit companies typically focused at the confluence of modern business operations and engineering or technical issues
- Attacked by a group of 4 capstone students
- Is intense, demands substantial time, and - most of all - is a transition for AES seniors from the world of the classroom and the world in which their careers will be built

Applied Engineering Sciences

Capstone Project Sponsors and Award Sponsor

We thank the following project sponsors for their generous support of the Applied Engineering Sciences capstone course.

AGreater Lansing Food Bank

Mid Michigan Red Cross
Mid Michigan Food Bank

MSU Surplus Store

Girl Scouts

Heart of Michigan Council

MSU Center for Service Learning and Civic Engagement (CSLCE)

Indestructible Dog Toys

XG Sciences

Peckham Industries

Mr. Phil Fioravante, alumni of our program, is the 2011 sponsor of awards for AES Capstone projects. Winners are determined based on both final written project reports and on oral presentations at Design Day. We thank Mr. Fioravante for his generous support of the AES program.

Recommendations for Delivery Routes between Mid-Michigan Food Bank and Greater Lansing Food Bank

There are two different food bank organizations in the mid-Michigan area: the Mid-Michigan Food Bank and the Greater Lansing Food Bank. Both food banks are less than 1mile apart and cover 3 similar counties (Ingham, Eaton, and Clinton). They provide emergency food to individuals and families in need. Food is distributed through an extensive network of food pantries and community kitchens located throughout the greater Lansing area. The Food Bank annually serves tens of thousands of people, many of them seniors and children. Their recipients also include the "working poor," those individuals who are employed but don't earn enough to meet housing, health, transportation and food needs.

We want to improve the transportation logistics of both the Greater Lansing Food Bank and Mid-Michigan Food Bank to better serve the community and increase efficiency. Today, there is overlap in the routing areas and unpredictability in the system due to various constraints such as time, staff, and communication. If this problem is ignored, it will be difficult to address when both food banks merge. By addressing these issues we can help to improve additional projects of concern such as food drives and the Garden Project. We will use value stream mapping and failure modes and effects analysis as methods to improve the current processes

Mid-Michigan FOOD BANK

Greater Lansing Food Bank

Michigan State University
Team Members

Brian Arickx
Anthony Caponigro
Sabrina Morris
Lauren Zrebski

Mid-Michigan Food Bank and Greater Lansing Food Bank
Team Sponsor

Terry Link

Recommendations for Outreach and Systematic Record Keeping
for Girl Scouts Operation

Our Applied Engineering Sciences team is working with the Girl Scouts Heart of Michigan, which is responsible for coordinating programs for over 25,000 girls in the Mid-Michigan area. The problem statement that we are working off of is that the Girl Scouts organization is not effectively collecting cookie sales data, and because of this, they are unable to make informed decisions based off previous activities related to cookie sales.We are hoping to accomplish two goals with our project. The first is to use process mapping to analyze the current processes of both door-to-door cookie sales and booth sales. Process flow analysis helps to illustrate where problems exist, and by comparing the current process to the process that should be in place, we are hoping to identify where improvements can be made. The second goal is to create a system for data collection, because currently there is no such system in place. This would allow the Girl Scouts to know roughly where cookies are being sold and more importantly, where they are not. According to a survey done by the Girl Scouts organization, 85% of the people surveyed would buy cookies if they were asked. This implies that the cookie program has a lot of room for expansion if the right systems are put in place. With door-to-door sales, we will use a geographical information system to enhance communications and map out locations where cookies are and are not being targeted. With the booth sales we will create a standardized process to enable data collection, analyze which establishments are most profitable, and look at ways to expand their customer base. The underlying goal of the cookie program is not only to sell cookies, but to build confidence, character and courage in the young girls. It is very important to us that we align our project goals with the underlying goals of the cookie program and that we are able to create tangible results beneficial to the Girl Scouts organization.

Girl Scouts.

Michigan State University
Team Members

Dakota Easlick
Mahmud Alio
Rachael Dalian
Terrance Yoon

Girl Scouts: Heart of Michigan Council
Team Sponsor

Karen Micklatcher

Recommendations for Enhancing Storage Capability and Visibility for MSU Surplus Store

Situated on the campus of Michigan State University, the Surplus Store services over 45,000 students and 10,000 faculty members. The Surplus Store provides recycling, resale of items, and storage for faculty and students. One goal for this business is to recycle and reuse any item if possible. Since 1920 the organization's vision is to become the premier university store in the nation by being resourceful, creative, and providing friendly and responsive customer service.

The MSU Surplus Store's student storage program is now its second year. The MSU Surplus Store is gaining attention for its close proximity to students and its low prices for storage. Similar to most new business models several changes and improvements are required to benefit customers and the store itself. Our Applied Engineering Sciences team will be working to improve the pick-up and drop-off scheduling and routing, modernize the data collection process, and also work to implement several ideas to add value to the storage business. With the only direction of moving forward and our broad Applied Engineering Sciences knowledge base, we are bound for success.

To tackle the problems at hand we plan on using the Six Sigma framework of DMAIC and value stream mapping. Additionally, we plan to do a capacity analysis during peak student storage pick-up. We will be using the results we find to make recommendations that will simplify the collection and flow of information and improve the flow of units of storage.

MSU SURPLUS STORE

Michigan State University
Team Members

Eric Saddle
Gary Golden
Matt Inch
Nikia Davis

Michigan State University Surplus Store
Team Sponsor

Kris Jolley

Recommendations for Improved Marketing of the Fill the Bus Event for the Center for Service-Learning and Civic Engagement

The Center for Service-Learning and Civic Engagement is a volunteer program at MSU that focuses on giving students an opportunity to get involved in their community. The Fill the Bus Program was started by CSLCE in fall of 2009 at MSU to help get freshman involved and interested in giving back to their community.

The Fill the Bus program gets students involved by having them donate school supplies, non-perishable food goods or health supplies. These donations are then collected, transported to a central location and divided up to be delivered to local charities where they can be best used to help people who need it

Through the help of Karen Casey, the director of CSLCE, the AES group hopes to collaborate with the dorms and local academic colleges in order to increase the participation of MSU students. The group also plans to use process mapping and project planning software to develop a system of collection and distribution that will help make the Fill the Bus program more efficient.

The team also plans to study the reports from last year's fundraiser to find the bottlenecks and potential problem areas, in order to find ways of improving the overall success of the program and coming up with contingency plans in case an unexpected event were to occur.

Michigan State University
Team Members

Ajay Singh
Alex Bromley
Garrett Kerns
Matt Long

Center for Service-Learning and Civic Engagement
Team Sponsor

Karen McKnight Casey

Recommendations for Lansing Web Sales Company to Develop Direct Link to Production for Indestructible Dog Toys

Our Applied Engineering Sciences team is working with Indestructible Dog Toys, an internet retailer that was founded in 2010 by partners Anthony Khedaywi and Patrick Kaplan. The premise behind their business is to find the most durable dog products on the market, bring them to one convenient website for customers, and provide them with a guarantee that the products will last no matter what dog gets his/her paws on them. As of now Indestructible Dog Toys only retails products online.

With the dog product industry actually growing during the current recession and only two big competitors, the company recently decided that they want to expand the business and make their own line of products, starting with a dog bone. With limited knowledge of the manufacturing industry, Indestructible Dog Toys met with our team to scope out the project objectives. Collectively we want to create a sourcing strategy that will assist the company in manufacturing a new indestructible dog bone.To complete the sourcing strategy we need to first better understand the dog toy industry. Next, we need to understand the injection molding process and how flavoring is added to plastics. Finally, we need to explore the requirements manufacturers have for related products to ensure a complete RFQ process is produced.

We will provide Indestructible Dog Toys with tools that will allow them to locate suppliers, find out pricing trends, and effectively receive best total cost quotes. Additionally, we need to educate them about industry standards. By doing this effectively, the company can grow faster than before in a growing market.

indestructible dog bark!

Michigan State University
Team Members

David Buchner
Dan Felder
Greg Fuhs
Kyle Pruner

Indestructible Dog Toys
Team Sponsor

Patrick Kaplan

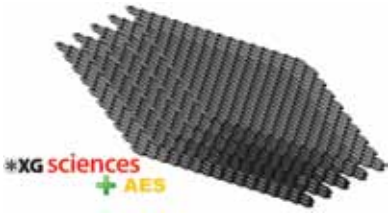
Marketing Analysis for XG Sciences An MSU High Tech Spin Off Company

XG Sciences is a privately held corporation based in East Lansing, Michigan. They produce a diverse range of graphene nano-platelets for potential use in many applications including composites, ultra-capacitors, batteries and transparent conductive thin films. The core of their technology was developed at the Michigan State University Composite Materials and Structures Center in the College of Engineering.

XG Sciences is searching for new applications and markets for their technology where they can compete successfully. One potentially large market is transparent conductive thin films used in display and solar cell technologies. These applications are currently dominated by indium-tin-oxide (ITO) and flourine-tin-oxide (FTO) thin films. XG Sciences would like to explore these markets further with respect to their potential profitability and ability to be successful in the competitive environment.

This project is divided into two main objectives defined as market analysis and competitive environment analysis. Within each of these objectives multiple goals are defined which will provide utility to XG Sciences at the completion of the project.

XG sciences



Michigan State University
Team Members

Alex Dawson
Alan Domzalski
Jacob Thousand
Thomas Moore

XG Sciences
Team Sponsor

Dr. Lawrence Drzal

Recommendations for Productivity Enhancement for Peckham Industries of Lansing, Michigan

Peckham Inc. is a non-profit organization that specializes in apparel manufacturing, business services, environmental solutions and supply chain solutions. The company was founded in 1976 where it began to provide services and employment opportunities to disabled individuals. Today Peckham Inc. is one of the biggest vocational community rehabilitation programs in the state of Michigan. Peckham's biggest customer is the United States government.

The project's problem statement is that we will make implementable recommendations to Peckham that will help improve their processes of information visibility and product completeness. Our goal is to provide a uniform approach to capture and record job order information in a way that will allow managers more visibility as to job completeness. With an improved process Peckham seeks to reduce inspections and overall errors created by shortage and labeling issues. This in turn will reduce costs due to wrong information and job incompleteness. Our group has been visiting the Peckham manufacturing facility to assist in developing improved operations processes. Additionally, we plan to begin work in testing and implementing some of our recommendations.

To solve these issues we plan on using the Six Sigma framework of DMAIC and value stream mapping. We will be using the results of the mapping to make improvements within the DMAIC approach. Peckham will be presented with before and after states with the improvements we have recommended. Our team plans on providing an action plan in order to implement our changes.

Michigan State University
Team Members

Jason Klug
Joe Kalvenas
Hui Liu
Rakan Bayouk

Peckham Industries
Team Sponsor

Zach Tomlinson

Carry your Spartan Pride!

Take MSUFCU With You

When you graduate, you don't have to close your account. Wherever your new career opportunities take you—take MSUFCU with you!

Shared Branching & Service Centers are a network of credit union locations where you can access your MSUFCU account for FREE and are available nationwide! Find a location near you at www.cuservicecenter.com.

ComputerLine & Mobile Banking Use ComputerLine, MSUFCU's free online banking to perform over 40 transactions anywhere, anytime as long as you have internet access. Plus, Green on the Go® Mobile Banking provides fast and secure account access anytime, anywhere for FREE* from your internet-compatible mobile phone.

eDeposit allows you to electronically deposit checks or apply them to your loans through ComputerLine. Simply scan your paper checks from home and apply them to your account!

FREE ATMs There are over 100 FREE MSUFCU ATMs in the Greater Lansing area and over 28,000 FREE CO-OP Network ATMs located nationwide where you can access your MSUFCU account, make transfers, and more.

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FEDERAL CREDIT UNION
Building Dreams Together

BAE
Department of Biosystems and Agricultural Engineering

BE485/ 487

8:00 a.m. – Noon
First Floor Lounge

BE 485 BIOSYSTEMS DESIGN TECHNIQUES AND BE 487 BIOSYSTEMS DESIGN PROJECT

PROJECT INSTRUCTOR:
STEVEN SAFFERMAN

PROFESSIONAL DEVELOPMENT INSTRUCTOR:
STEVE MILLER

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.

BE 485/487 Biosystems Design Techniques & Projects

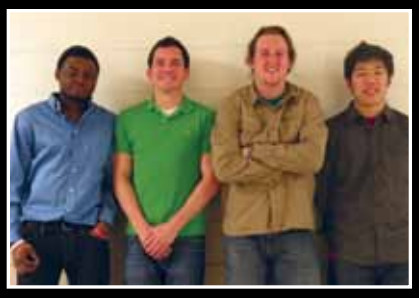
Urban Aquaculture

Urban aquaculture can provide fresh seafood and jobs to local residents while showcasing the benefits of biologically sustainable solutions. The objective of this project was to develop a generic model that simulates an aquaculture system's design requirements. Capital and operational costs were estimated to determine the feasibility of an aquaculture farm. The team then performed a case study on a facility in Detroit to determine the validity of the model.

A computer model was developed using Microsoft Excel. The model is based on species commonly used for fish farming including trout, catfish, yellow perch, and tilapia. By incorporating species specific information and allowing users to modify system parameters, accurate results are obtained. Specifications for a facility's main components are determined including tank size, filtration rate, oxygen addition, water disinfection, and solids removal. Costs are estimated using up to date prices from manufacturers.

The model was tested to determine accuracy and ease of use for a site-specific case study. Results showed that the model is a useful tool for estimating the primary costs associated with developing a fish farm. A sensitivity analysis revealed that feed, fingerling, and energy prices have the greatest effect on cost.


Yan Liu



Team Members
Michael Holly
Saint Clair Shores, MI

Blake Lougheed
Rockford, MI

Qudus Ahmed
Lansing, MI

Andy Tran
South Lyon, MI

Faculty Advisor
Yan Liu, Dept. of Biosystems and Agricultural Engineering

Industry Advisors
Jim Green
Pingree Farms

Kent Herrick
Aquaculture Research Corporation

Erin Sutton and Rebecca Busk
Urban Agricultural Initiatives of Detroit

Corn Drying Using Bio-based Fuels

On-farm corn drying in the Midwest is primarily accomplished using propane as a heating fuel. The main objective of this project is implementing a biomass combustor to work in conjunction with a small-scale propane drying system (less than 60,000 bushels per season).

The project design is divided into four components:biomass combustion, heat transfer, grain drying, and emission filtration. Heat leaves the combustor at an average temperature of 1400°F and enters an indirect contact heat exchanger. Clean air warmed to a fixed grain drying temperature enters the dryer. After heat transfer is achieved through a heat exchanger, combustion gases pass through a cyclone separator system to remove particulate.

Economic analysis revealed a substantial capital investment and extended payback period for the duel fuel system. Corn is dried for 3-4 weeks after fall harvest and the drying season cannot be increased without causing a substantial decrease in the quality of the corn. However, two possible ways to reduce the payback period are: investigating off-season uses for the combustor and qualifying for government incentive programs. As propane prices increase, this project becomes more attractive.

BIOenergy ALTERNATIVES

Larry Klope

Team Members
Shaun Madsen
Oxford, MI

Samuel Prentice
Novi, MI

Kyle Fischer
Grosse Ile, MI

Nick Steo
Rochester, NY

Sponsor/Mentor
Ajit Srivastava
Department of Biosystems and Agricultural Engineering

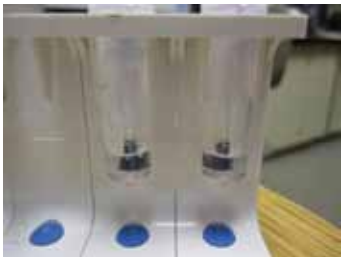
Faculty Advisor
Larry Klope

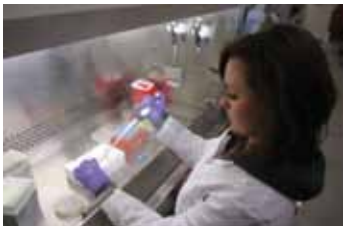
E. Coli Monitoring and Detection in Recreational Waters

Escherichia coli (E. coli) is a bacteria used to indicate the presence of fecal matter. Using the standard detection protocol, Ingham County Health Department reports that E. coli levels have exceeded the current Michigan Department of Environmental Quality safety limits of 300 colony forming units per 100 mL of sample within sections of the Red Cedar River.

The objective of this project is to develop a low-cost protocol that can be used to find the likely sources of E. coli impairment so that preventative techniques (best management practices) can be instituted. Identifying the source of the impairment will require that a substantial number of samples be collected and analyzed but the standard, regulatory method is expensive and requires substantial resources, limiting the number of samples that can be collected and analyzed. With the data from the simplified method, a statistical analysis can be conducted to determine likely locations of the impairment.

Consequently, this project entailed developing a protocol with the following three components: water filtration to remove debris and concentrate bacteria, E. coli detection using an antibody-based biosensor, and statistical analysis the data to determine impacted regions of the Red Cedar River.





Evangelyn Alocilja

Team Members
Asmaa Abdel-Azim
Niskayuna, NY

Bridget Bednark
Onaway, MI

Drew Coatney
Clarkston, MI

Sponsor/Mentor
Jim Wilson
Ingham County Health Department

Faculty Advisor
Evangelyn Alocilja, Department of Biosystems and Agricultural Engineering

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

According to a North American Consumer Goods Company, alternatives to meat products such as meatless, soy-based, burgers are gaining popularity. Currently, the company utilizes a co-manufacturer for the production of meatless burgers on two processing lines. Line 2 produces burger batter with an acceptable quality while line 1 does not pass quality control standards for regularity. To utilize line 1, additional ingredients are required to give the wet batter a consistency comparable to the acceptable batter, resulting in $80,000 of incremental costs each year. An alternative solution to achieve acceptable, consistent products from both lines utilizing the originally specified formulation is desirable. The objectives of this project were to characterize both production lines, identify potential causes for differences in product characteristics, and recommend process line modifications to enable the company to utilize the original meatless burger formula.

In order to accomplish these goals, the team visited the manufacturing plant to characterize both production lines. Pilot-scale mixing experiments were then performed at Michigan State University to determine the relationship between processing parameters and burger batter moisture content, water activity, and texture.

After determining relationships between processing parameters and batter characteristics, recommendations were proposed to improve the consistency of meatless burgers produced on line 1. A trial was conducted at the manufacturing plant to test the recommendations to produce meatless burgers that meet quality control standards.

Jim Steffe

Team Members
Ellen Bornhorst
Houghton, MI

Cassie Giacobassi
Litchfield, MI

Drew Selden
Dewitt, MI

James MacLellan
Walled Lake, MI

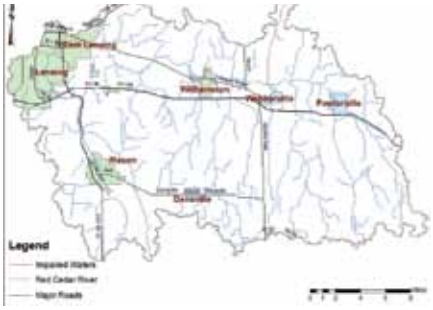
Faculty Advisor
Jim Steffe
Department of Biosystems
and Agricultural Engineering

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

Parts of the Red Cedar River do not meet water quality standards because of impairment with E.coli. The Ingham County Health Department requested a strategic plan that will restore the Red Cedar River to regulatory limits. This project determined point and non-point sources of excessive E. coli and developed a plan that will ultimately improve water quality.

Determining the cause of pollution in the Red Cedar requires accounting for sources in the entire Red Cedar Watershed. The project used statistical analysis and watershed models to determine which areas likely contributed to high E. coli levels. This technique simulates hydrological processes and tracks the transport and die-off of bacteria throughout the watershed.

Best management practices, such as riparian buffers and rain gardens, are used to mitigate bacterial pollution before it reaches the river. These devices were entered into the watershed models to predict improvements to river water quality.



Ingham County Health Department

A. Pouyan Nejadhashemi

Team Members

Jennifer Jury
St. Johns, MI

Cody Kurzer
Sebewaing, MI

Catherine Dudgeon
Rochester Hills, MI

Sponsor/Mentor

Jim Wilson
Ingham County Health Department

Faculty Advisor

A. Pouyan Nejadhashemi
Department of Biosystems and Agricultural Engineering

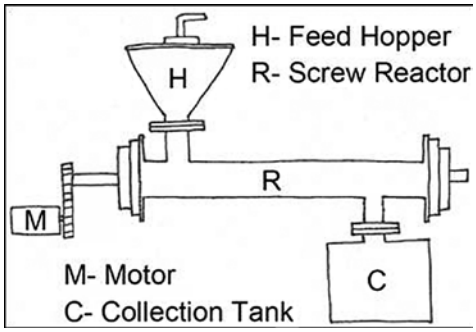
Bio-Fuel Source Optimization through Torrefaction

Michigan legislation calls for displacement of coal in power plants, requiring a percentage of energy be produced from renewable sources. Burning biomass is an option. However, biomass has a lower energy value than coal.

Torrefaction is a biomass pretreatment process which leaves 90% of the energy in 70% of the original mass. Additionally, producing torrefied biomass close to the point of collection concentrates the energy reducing shipping costs per unit amount of energy produced.

There is a lack of experimental systems to test the torrefaction of biomass feedstocks. The project objectives were to design, fabricate, and test a pilot-scale torrefaction reactor. A protocol to test and compare the energy content of the torrefied biomass, raw biomass, and coal using a streamlined life cycle analysis was also developed.

A screw conveyor reactor was selected. Biomass is introduced to the system through a feed hopper and then proceeds through the reactor where torrefaction occurs. Torrefied biomass falls into a collection tank where it is allowed to cool. Thermocouples are used to monitor temperature at various points within the system.




Chris Saffron

Team Members
Spencer Beatty
Harbor Springs, MI

Ryan Black
Battle Creek, MI

Ryan Rochelle
Brighton, MI

Jason Smith
Pigeon, MI

Faculty Advisor and Sponsor
Chris Saffron
Department of Biosystems and Agricultural Engineering

Wastewater Treatment System Upgrade for a Small Cheese Producer

A small-scale cheese producer who uses milk from local Amish dairies plans to expand production and thus produce a greater amount of wastewater. To be proactive in accommodating the increase in wastewater, the company desires a new treatment system. Of great importance to the owner is to respect the Amish way of life and to maintain a less automated, more manual treatment system.

Wastewater can pose serious human health risks and contribute to environmental degradation. Effluent from food processors typically have a high organic content, as indicated by biological oxygen demand (BOD).

Based on factors such as cost, treatment effectiveness, maintenance, energy requirements, and land use, a lagoon with an open sand bed gallery was selected as the treatment system. A lagoon is a shallow constructed pond that treats waste by sedimentation and bacterial activity. An open sand bed gallery contains small particles with high surface area in contact with the wastewater where a biofilm is cultivated. To design the system, several techniques were used, including a topographical survey, soil testing, wastewater characterization, and mathematical models. The completed design will be approved by Larry Stephens, a professional engineer, and then constructed on site

Larry Stephens

Team Members

Megan Buhl
West Bloomfield, MI

Shannon Henderson
Harrison Twp. MI

Stepfanie Shaulis
Engadine, MI

Faculty Advisor Advisor

Larry Stephens
Stephens Consulting Service

Site Characterization and Design Plans for a Created Forested Wetland

The Michigan Department of Transportation (MDOT) is at a deficit for wetland mitigation credit in the Maple River Watershed due to construction of the St. Johns Bypass on US 127. MDOT requested design plans for the creation of a forested wetland that is cost effective, innovative, and fits within the landscape.

Through ArcGIS mapping and field surveys, the construction site was characterized to determine hydrology, topography, and soil classification. In order to determine the hydrologic regime of the system a water balance excel model was developed to predict inundation period and daily water height. Site design was optimized to minimize excavation, maintain wildlife usage, and ensure vegetative establishment.

Results of the water balance indicate sufficient water for a forested wetland ecosystem. Stop-log control structures and an earthen berm constructed from on-site soil are utilized to facilitate the necessity for precise water depths. The design includes small areas of emergent and scrub-shrub wetland to promote ecological diversity.

AutoCAD design drawings depict plan, cross-sectional, and structural component views. Specifications are provided for construction of the site with details on required grading, vegetation planting, wildlife structures, and long-term monitoring.

MDOT
Michigan Department of Transportation

Dawn Reinhold

Team Members
Alyse Egner
Burton, Michigan

Kevin Koryto
East Lansing, Michigan

Hanna Miller
Midland, Michigan

Sponsor/Mentor
Michael Pennington
Michigan Department of Transportation

Faculty Advisor
Dawn Reinhold
Department of Biosystems and Agricultural Engineering

CE 495

8:00 a.m. – Noon
MSU and Lake Michigan Rooms

CE 495 Design Engineering Project

CE 495 SENIOR DESIGN IN CIVIL ENGINEERING

FACULTY ADVISORS: Professors: Chatti, Haider, Kodur, Maleck, Tarabara, Wallace


Chatti


Haider


Kodur


Maleck


Tarabara


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; DC Engineering; East Lansing Dept. of Public Works; Fishbeck, Thompson, Carr & Huber; HNTB; 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

Daniel Christian, PE
Tetra Tech MPS
Lansing, MI

Matt Junak, PE
HNTB
E. Lansing, MI

Kurt Krahulik, PE
DC Engineering
DeWitt, MI

John LeFevre, PE
FTCH, Inc.
Lansing, MI

Peter Margules, PE
NTH Consultants
Northville, MI

George McKenzie, PE
NTH Consultants
Lansing, 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

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

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

Phil Vogelsang, PE
URS Corporation
Grand Rapids, MI

Award Sponsors

BARR

FTCH

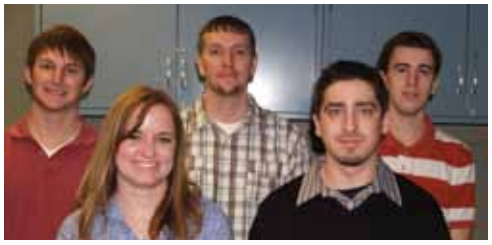
CE 495 SENIOR DESIGN IN CIVIL ENGINEERING

Team 1: Back, l-r: Colin Hassenger, Andrew Gronowski, Erik Ohlsson, Front, l-r: Sam Bell, Keagan Robert Niles, John Paul

Team 2: Back, l-r: Caleb Seder, Daniel Royal, Rebecca Forbes Front, l-r: Dustin Atwood, Adam Beach, Elaine Belenky

Team 1
8:00 a.m.
MSU Room

Team 2
8:00 a.m.
Lake Michigan Room



Team 3: Back, l-r: Joe McAttee, Brian VanZee, Erik Korpalski Front, l-r: Christine Pageau, Joe Cilluffo. Not pictured: Emily Gezon, Ryan Muscott

Team 4: Back, l-r: Cory Kramer, Brandon Boatman, Kelly Roulier Front, l-r: Brian Wybrecht, Sri Kumar, Brian Schultz, Ebrahim Husain

Team 3
9:20 a.m.
MSU Room

Team 4
9:20 a.m.
Lake Michigan Room

Team 5: Back, l-r: Arinze Udegbunam, Alex Sadovskiy, Iden Thomas Kalabat. Front, l-r: Katie Paluch, Ali Nessari, Joseph Williams, Not pictured: Anthony Tolbert

Team 6: Back, l-r: Thomas Hoffman, Austin Crawley, Kyle Sabotta Front, l-r: Nicholas Tecca, Molly Fitzpatrick, Kevin J. Borst, Corbin St.Aubin,

Team 5
10:40 a.m.
MSU Room

Team 6
10:40 a.m.
Lake Michigan Room

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.

CE 495 Senior Design in Civil Engineering

Undergraduates in civil engineering must take CE 495. This capstone course prepares students for the work place 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.

ChE 434

8:00 a.m.-Noon
First Floor Lounge

ChE 434: PROCESS DESIGN AND OPTIMIZATION II

INSTRUCTOR:
Professor Martin Hawley

COURSE ASSISTANTS:
Stephanie Crews and Susan Farhat

Course Description:

This course is a logical extension of the first semester of chemical engineering senior design. The abilities developed over a wide range of chemical engineering courses are now applied to a problem extending over a somewhat longer period of time; requiring more initiative, enterprise, care, and a greater measure of individual responsibility. For the 41st successive year, we have worked the American Institute of Chemical Engineers (AIChE) Student Contest Problem. We use these industry designed problems for three reasons: 1) they are well-rounded problems, 2) they tell our students and our faculty something about the kind of abilities that industrial companies would like graduating chemical engineers to have, and 3) there is the advantage of seeing how well our students compare with graduates of other universities in a national competition of this quality.

For Design Day, 5 teams and 5 individuals were chosen to present their design via a poster presentation. From this final group, 2 teams of two and 2 individuals will be chosen to compete in the national AIChE competition in the fall. Since 1968, about half the students whose reports rated first or second at MSU also finished among the top six nationally.

ChE Students Sweep National Design Competition!

Three students who presented at last Spring's Design Day took top honors in the 2010 AIChE National Student Design Competition. Philip Lehman, a current senior in chemical engineering, won 1st place in the individual competition; while MSU graduates Christopher Gelinas and David Hasselbeck took 1st place in the team competition (pictured).

All three students were able to travel to Salt Lake City in November 2010 to present their solutions at the AIChE National Meeting. Congratulations, Phil, Chris, and David!

(l-r): Christopher Gelinas and David Hasselbeck

Philip Lehman

AIChE®

PROBLEM STATEMENT:

Gas to Liquids (GTL) Plant Design

The conversion of syngas (CO & H_2) to hydrocarbons via the Fischer-Tropsch synthesis is used for the production of liquid fuels. This method is an especially attractive alternative when petroleum reserves are scarce, or coal and/or natural gas reserves are abundant. The objective of this design was to design a grass-roots Fischer-Tropsch Reaction unit, including product separation facilities, as part of a planned GTL plant. The design must be safe, environmentally clean, and profitable; the system should effectively integrate with the other units within the GTL plant.

Nathan Hanna


Mark Maiville


Nathaniel McIntee-Chmielewski


Phong Pham


Alex Ritter


(l-r): Anthony Grittini and Lisa Pillow


(l-r): Chad LaFeldt and Omar McGiveron


(l-r): Dante Pertusi and Derek Gremban


(l-r): Jason Schneemann and Michael Mendoza


(l-r): Scott Stone and Gabrielle Kleber

ChE 491

8:00 a.m.-Noon
First Floor Lounge

ChE 491: SELECTED TOPICS IN CHEMICAL ENGINEERING – BREWING & DISTILLED BEVERAGE TECHNOLOGY

INSTRUCTOR:
Professor Kris Berglund

Course Description:

The ChEMS department at MSU offers a senior Selected Topics Course. This section of Selected Topics is titled Brewing and Distilled Beverage Technology. The objective of the course is to teach students the fundamentals of brewing and distilled beverage production from a biochemical engineering perspective. Lectures and laboratories for this class take place at the Michigan Brewing Company in Webberville, MI.

Topics discussed include raw materials for fermentation; basics of alcohol fermentation; basics of distillation; production of brandy, whiskey, vodka, and gin; and flavor chemistry. In addition, students will learn the background of the industry of beverage distillation, including the tax laws and regulations involved with this business. Laboratory projects include simple pot distillation, whiskey production, vodka production, and barrel aging of spirits.

.

Honors Option Project: Computer modeling of two-column still for spirits distillation

Students: Derek Gremban and Dante Pertusi

The objective of this project is to complete an Aspen Plus simulation of the two column still being used for commercial production of Michigan spirits at the Michigan Brewing Company in Webberville Michigan. This still is set up in a unique configuration, with one large still split up into two columns that operate in series, and the main idea is to use Aspen to model this slightly unusual situation. Results of the work can hopefully be used to help operators at Michigan Brewing Company optimize their spirits production process.

(l-r): Dante Pertusi and Derek Gremban


SENIOR DESIGN CAPSTONE IN MATERIALS SCIENCE AND ENGINEERING

INSTRUCTOR: Prof. James P. Lucas

TA Staff: Yiyi Yang

MSE 466

8:00 a.m. – Noon
First Floor Lounge

Course Description

MSE466 is a senior course for Materials Science & Engineering majors that provides students with a team-based capstone design experience. A major objective of this course is to have students apply their course-learned background knowledge and skills in materials science and other disciplines to real-life design problems. Failures are a major motivating factor for promoting innovative designs or design changes. A failure analysis investigation provides a unique platform to design and to solve a real-world engineering problem via a systematic engineering approach. By focusing on a specific design failure, the student teams learn how to confront an open-ended problem that requires them to develop a strategic design plan and to execute the methodology for assessing how and why the failure occurred. The analysis is conducted using established investigative procedures and constraints for conducting failure analysis investigation. This semester, there are three 4-5 member teams working on three real engineering failures.

Successfully completed team projects culminate in a comprehensive written final report and a strategic redesign plan to improve the design and mitigate future failures. The teams will give poster presentations that summarize their findings. Failures being investigated by the teams are the following:

Team 1:
l-r: Chelsea Friday**
Lauren Blair
Nikki Koivunen
Sho Koba
(**team leader)

Team 2:
l-r: Rachel Kamish
Jordan Hackert
Derek Miller
Aaron Winter**
(**team leader)

Team 3:
l-r: Pamitta Thamphairoj
Chelsea House
Lucy Thomas
Sarah Meyer
Marc Pietrocarlo**
(**team leader)

Stem-Fracture of 'Pressure Mushroom' Fasteners
Team 1: 'Jeopardized Junk'

Macroscopic examination of the pressure mushroom fasteners showed complete fracture of the stem from the cap. Preliminary results also indicated that the failure occurred by a brittle fracture mode. At this point early in the FAI, it is suggested that factors associated with materials selection, heat treatment and hardening, and manufacturing processes need to be critically investigated. Multiple failures of the part have occurred in service resulting in line shutdown and productivity loss.

Nucor-5160 T&P Round Steel Bars Fracture during Straightening Process
Team 2: 'Epic Fail'

Vendor information purported that the 5140 T & P round steel bars subjected to torsion loading failed during a second stage straightening (S-S-S) process. Prior to the S-S-S process, the bar was hot-rolled and its diameter reduced by 4.6%. Routinely, the S-S-S process is considered a minimal-stress operation. However, preliminary findings suggest otherwise as surface hardening, roughness and cracking were observed in conjunction with internal residual stress induced cracking. The S-S-S processing procedures and materials selection are issues warranting further investigation.

Deformation and Fracture of a Torsion Garage Door Opener Spring
Team 3: 'Crack Crusaders'

A steel garage door spring failed prematurely under cyclic torsion loading. Macroscopic visual examination appeared to show that fracture of the spring was due to crack propagation to failure by fatigue crack growth initiating on the spring's surface. The spring failed at 80% of life expectancy. As yet, the primary source responsible for the failure is undetermined. Though, preliminary findings suggest the introduction of surface defects, perhaps, during manufacturing. Possibly, corrosion issues related to environmental service conditions played a role in this failure.

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

Chrysler Group, LLC
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The Dow Chemical Company
Midland, Michigan

GE Aviation
Grand Rapids, Michigan

Medtronic, Inc.
Mounds View, Minnesota

Meijer
Grand Rapids, Michigan

Motorola Mobility
Libertyville, Illinois

Raytheon
Fort Wayne, Indiana

Sparrow Health System
Lansing, Michigan

TechSmith
Okemos, Michigan

Urban Science
Detroit, Michigan

Ontario

7:30 a.m. –11:45 a.m.
Third Floor
Lake Ontario Room

Computer Science and Engineering Capstone Course Projects

Presentation Schedule – Lake Ontario Room

Dr. Wayne Dyksen, Professor

Time	Team	Project Title
7:30 a.m.	Auto-Owners	Agent Multimedia Advertisement Builder
7:50 a.m.	Boeing	BAPS: Battle Aircraft Position Share
8:10 a.m.	Chrysler	Fleet Auction Distribution and Sale Optimizer
8:30 a.m.	Dow	Business Approval System
8:50 a.m.	GE Aviation	MSU Next Generation Flight Deck
9:10 a.m.	Medtronic	Cloud-Based Athletics Operations Center
9:30 a.m.	Break	
9:45 a.m.	Meijer	Consumer Payroll Check Cashing Analytics
10:05 a.m.	Motorola Mobility	Enhanced Content Authoring Services
10:25 a.m.	Raytheon	Dynamic Spectrum Access for Network Radios
10:45 a.m.	Sparrow	iSupport Center
11:05 a.m.	TechSmith	WhiteCaps: Mobile Whiteboard Capture Solution
11:25 a.m.	Urban Science	Bringing LeadVision to the Web

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:

- Designing, developing, 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, Dow, Ford, GE Aviation, General Motors, IBM, Medtronic, Meijer, Microsoft, Motorola, Raytheon, Sircon, Sparrow Health System, TechSmith, Terex, Toro, Two Men and a Truck, the Union Pacific Railroad, and Urban Science.

Auto-Owners Insurance
Agent Multimedia Advertisment Builder

Auto-Owners Insurance operates solely through over 6,700 independent agents in twenty-six states to provide insurance that is "Safe, Sound and Secure"®. To help these agents advertise in their local communities quickly and easily, we have created Agent Multimedia Advertisement Builder.

Using this web application, independent agents can fulfill all of their print, television and radio advertising needs. Starting with standard templates provided by Auto-Owners, agents can produce customized, professional ads in minutes.

Each agency has a system account that includes an agency profile, which contains contact information along with an uploaded logo and uploaded images that may be used to customize ads. After an agent selects a template ad, the system automatically populates it with all of the agency-specific information, making it very easy for agents to build and preview potential advertisements.

Once created, customized ads are automatically submitted to Auto-Owners for review. Agents are then notified by email that their proposed ad has been accepted or are given suggested changes for editing and resubmission.

For users at Auto-Owners, the system supports other features including the ability to view a history of ads submitted as well as statistical reports, such as the use of particular templates.

The 6,700 independent Auto-Owners Insurance agents now have a quick and easy way of creating and customizing their own advertisements.

Auto-Owners Insurance
Life Home Car Business
The "No Problem" People®

Michigan State University
Team Members (left to right)

Patrick Nelson
Milford, Michigan

Joseph Korolewicz
Sterling Heights, Michigan

Daniel Jones
Grand Haven, Michigan

Auto-Owners
Corporate Sponsors

Bob Buchanan
Lansing, Michigan

Megan Collins
Lansing, Michigan

Matthew Dickinson
Spring Arbor, Michigan

Scott Lake
Lansing, Michigan

Amy Watson
Lansing, Michigan

The Boeing Company
BAPS: Battle Aircraft Position Share

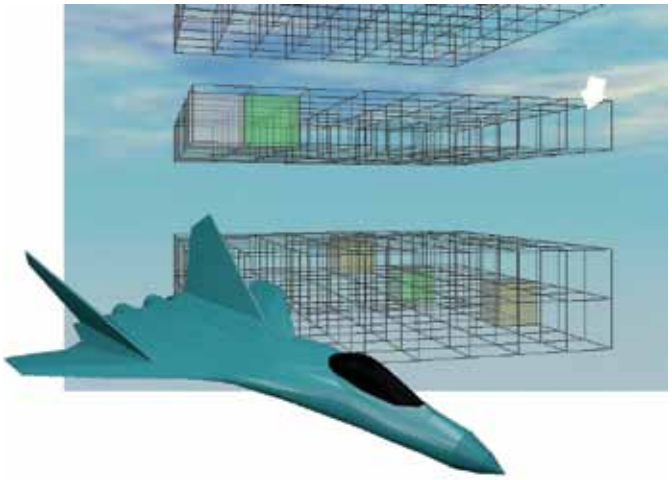
Battle Aircraft Position Share, or BAPS, combines strategy and quick thinking as players compete to seek and destroy each other's targets in a 3D battle arena. BAPS mixes both turn-based and real-time game play. Players have a limited amount of time in which to fire but can always command their fleet.

Opposing players utilize a fleet of radar transmitter and radar receiver planes to reveal the location of enemy targets within the environment. Effective scanning provides a higher probability of hitting enemy targets when firing. Radar is simulated by a simple algorithm determined by unit positions and the angle of reflection. Aircraft are constantly in motion and consume fuel based on pitch and speed.

In order to win a game, a player needs to deal with information overload and respond to feedback resulting from game events. It is the player's choice whether to micromanage their units or focus their efforts on alternate strategies.

Since BAPS is controlled by a network-based game manager, opposing players can be at different locations. All network communication between the game manager and clients is encrypted. The game manager keeps the game information in sync for both players. The manager also provides a statistical and graphical overview of the current state of the game.

BAPS is compatible with Microsoft Windows XP/Vista/7. OpenSceneGraph is used to render the game environment and handles the game engine. WinSock handles the network connectivity. All models are created with Blender.



BOEING

Michigan State University
Team Members (left to right)

Steven Garske
Bay City, Michigan

Eric Muller
Novi, Michigan

Adam Cook
Shelby Township, Michigan

Andrew Kos
Grosse Pointe, Michigan

Boeing
Corporate Sponsors

Pete Clive
Saint Louis, Missouri

Matt Daniels
Saint Louis, Missouri

Jayson T. Vincent
Saint Louis, Missouri

Steve Yallaly
Saint Louis, Missouri

Chrysler Group, LLC
Fleet Auction Distribution and Sale Optimizer

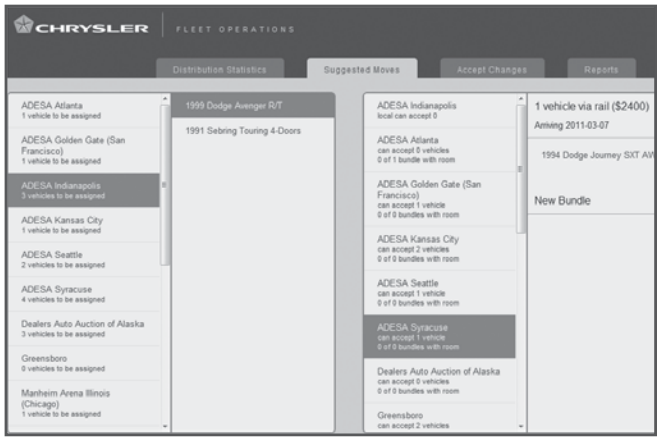
Chrysler Group, LLC fleet customers return vehicles to marshaling yards at various locations throughout the nation. The objective is to distribute each vehicle to the auction that will sell it at the highest price.

The Chrysler distribution manager will be using our application to determine the optimal auction location around the country to send and subsequently sell the returned vehicle. There are eighteen auction sites to consider, and a vehicle may sell for a different price at each, depending on the local dealer demand for that type of vehicle.

Our application automates the process of predicting approximately how much a vehicle will sell for at each auction and shows which auction has the highest demand for a specific vehicle based on past sales and inventory data. The system allows the manager to target a specific vehicle body model and automatically distribute vehicles throughout the country.

In the screenshot shown to the right, the distribution manager can view a summary of how vehicles are selling, and how the current distribution compares to the target distribution. Our system determines the optimal auction site for each vehicle. The distribution manager is then able to make adjustments to the stock of vehicles at each auction site as they deem necessary.

Our system automates most of the decision making, but also focuses on providing the distribution manager with the information required to make the best possible decisions, overriding our system's decisions when necessary.



CHRYSLER

Michigan State University
Team Members (left to right)

Kashif Khan
Guna, India

Jeffrey Yang
Wyoming, Michigan

Dennis Cornwell
Port Huron, Michigan

Zach Church
Davison, Michigan

Chrysler
Corporate Sponsors

Meira Curley
Windsor, Ontario

Art Magri
Windsor, Ontario

Rick Rose
Auburn Hills, Michgan

Bill Whedon
Auburn Hills, Michgan

Karen Wrobel
Auburn Hills, Michigan

The Dow Chemical Company
Business Approval System

Money is the lifeblood of every company. Every corporate officer and board member has an obligation to the stockholders to ensure that money is being used responsibly.

The Dow Chemical Company currently has a process in place to approve or reject spending requests. For every department in the company, there is a clearly defined chain of approval through which all material spending requests must be routed. Once every person in the chain approves the request, the funding is provided.

One of the purposes of technology is to improve the quality of our lives by making certain tasks easier. With that idea in mind, we set out to build a system to handle the existing approval process automatically. Our software notifies the people involved in the approval process by email when a new request is created. It also routes the request to each individual in the appropriate order.

Our Business Approval System also allows each approver in the chain to enter comments, and all of the people in the process can review them and add their own. A historical record of all requests is maintained.

In the fast-paced modern business environment, people need to be able to access the software from a variety of devices, from a PC or laptop to an iPad or smartphone. Our software is able to be used from any of those devices to facilitate that lifestyle.

Michigan State University
Team Members (left to right)

Joe Amenta
Sterling Heights, Michigan

John Furcean
South Lyon, Michigan

Joseph Langford
Utica, Michigan

Dow
Corporate Sponsors

David Asiala
Midland, Michigan

Martin Brennan
Midland, Michigan

Jeremy Preston
Midland, Michigan

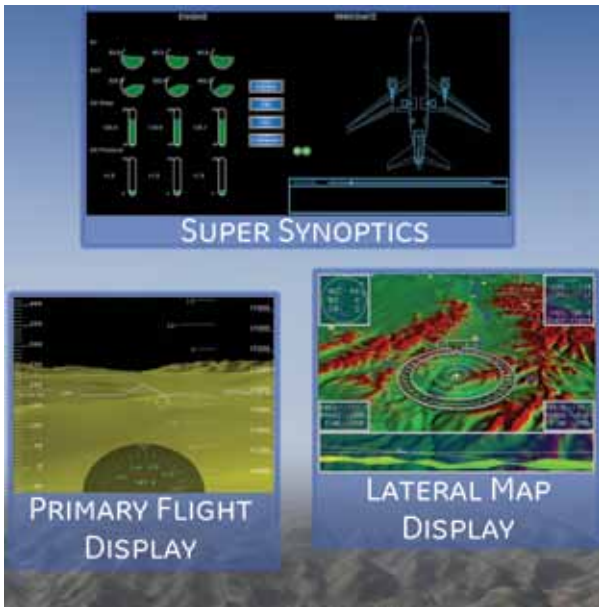
GE Aviation
MSU Next Generation Flight Deck

You are flying a Boeing 747 headed from Paris to L.A. with 400 exhausted passengers on board. Air Traffic Control has just alerted you to a massive storm system dead ahead. Neither your customers nor your boss want to hear that you needed to divert to Nebraska. This has been a long and exhausting flight, and weaving through a storm will not be a simple task. Now what do you do?

With the GE MSU Next Generation Flight Deck, the answer is simple: ask the Lateral Map for a new course, accept the new plan, and follow the intuitive guidance cues provided on the Primary Flight Display. Thanks to the Next Generation Flight Deck's revolution in flight deck design, flight crews are now better equipped than ever to fly aircraft safely and reliably, even in the direst of situations.

The culmination of two years' work by four MSU-borne teams, the Next Generation Flight Deck is more than the sum of its parts. At first glance, the flight crew notices the sleek modern graphics and intuitive design of each individual display. But the real revolution is acting out behind the scenes, where each system is working in harmony with the others to provide the flight crew with the right information in the right format at the right time. This cross-functional integration, inclement weather avoidance being just one example, represents a major departure from the federated days of yore.

Nothing can replace the skills and ingenuity of an experienced flight crew. But with the Next Generation Flight Deck by GE and MSU, we can harness these resources to their fullest, guaranteeing everyone a safe and enjoyable journey.



Michigan State University
Team Members (left to right)

William J. Zajac
Shelby Township, Michigan

Steven Cornfield
West Bloomfield, Michigan

Alexander Delgado
Lansing, Michigan

Daniel Alexander II
Jackson, Michigan

GE Aviation
Corporate Sponsors

Michael Blair
Grand Rapids, Michigan

Aaron Gannon
Grand Rapids, Michigan

Dashiell Kolbe
Grand Rapids, Michigan

Medtronic, Inc.
Cloud-Based Athletics Operations Center

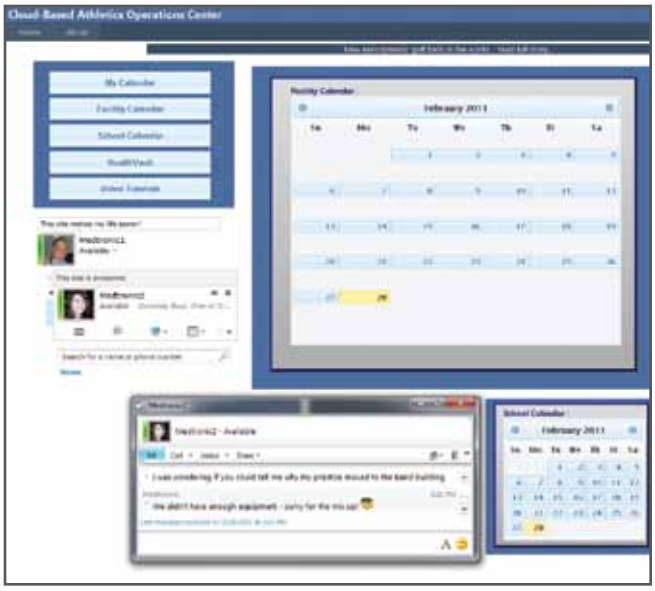
For over 50 years, Medtronic's mission has been to alleviate pain, restore health, and extend life. As an ongoing effort to extend services, a sample service offering hosted by Microsoft Azure Cloud Services was designed and developed.

The objective of our software system is to put coaches, student athletes, and a facilities administrator into one toolset to provide information and collaborate on improving the overall health of the student athlete to ensure playing status. With many teams and facilities to manage, proper allocation of resources and equipment becomes an important issue.

Our team has created a cloud-based Athletics Operations Center to enable coaches and student athletes ease of access to robust utilities such as People Presence, Calendaring, and Instant Messaging. The users of the system also have access to Health Records, Videos, and relevant RSS Feeds.

The key focus of the Athletics Operations Center is to provide coaches and student athletes a cohesive environment in which to access valuable information. Instant Messaging enables coaches to easily communicate with others using the system. The Calendaring feature allows for quick recognition of event conflicts, or insufficient resources.

The Athletics Operations Center is accessible via any modern web browser, and is primarily intended to be viewed on large kiosk-like systems. The web application is written in ASP.NET and C# with a Windows Azure cloud-based back-end.



Michigan State University
Team Members (left to right)

Caitlin Russ
Sterling Heights, Michigan

Evan Francis
Grand Rapids, Michigan

Michael Holp
Lansing, Michigan

Christopher Paterson
Muskegon, Michigan

Medtronic
Corporate Sponsors

Vandy Johnson
Mounds View, Minnesota

Tim Paffel
Mounds View, Minnesota

Renee Schneider
Mounds View, Minnesota

Jeff Mutschler (Microsoft)
Mounds View, Minnesota

Meijer
Consumer Payroll Check Cashing Analytics

In order to help customers save time and also provide convenience, Meijer has set up a system to allow customers to cash their payroll checks at the store.

While there are many benefits to providing this service, it also creates problems when people begin to cash fraudulent checks and therefore steal from Meijer.

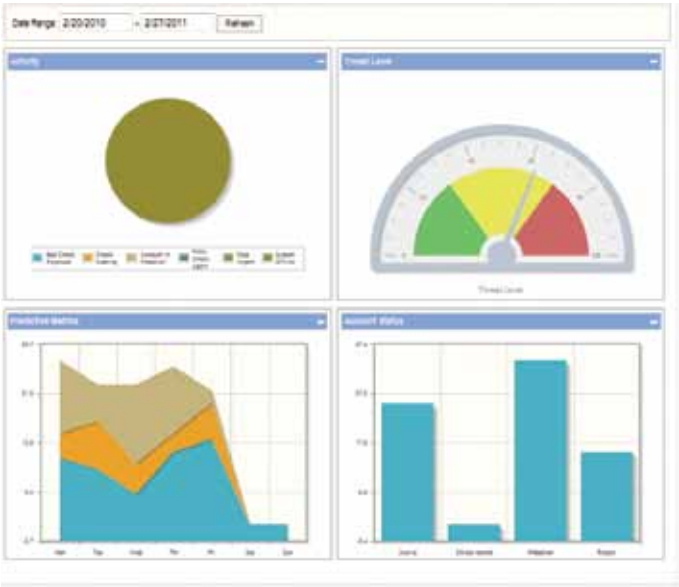
In an effort to prevent or detect these fraudulent activities, we developed web-based software called the Consumer Payroll Check Cashing Analytics that can be used to track the number of fraudulent checks cashed and to predict future fraud.

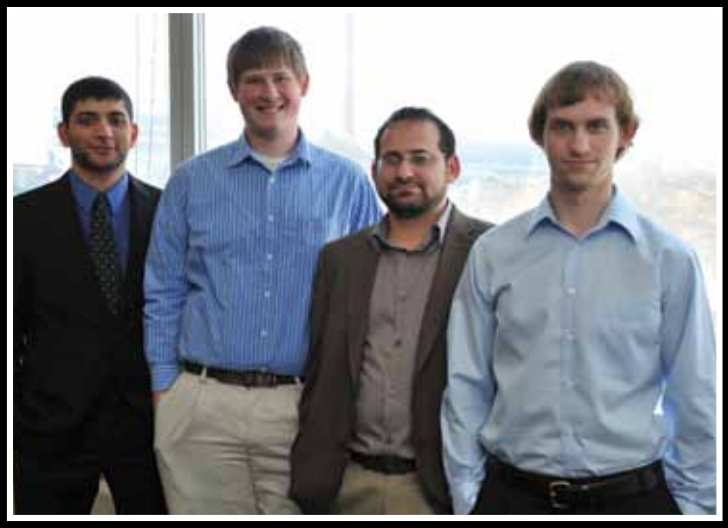
Working with Meijer, we were able to create an easy-to-use web page that they can use to search for customers that have cashed a payroll check to see if they are passing bad checks.

To help visualize the different kinds of activities that a customer is doing, graphs and charts were put into our program as shown on the right. A report of recent activity can be created against the entire Meijer chain, or a group of particular stores to help identify trends.

The Consumer Payroll Check Cashing Analytics system can be accessed with both Internet Explorer and Firefox using Windows XP, Vista, and Windows 7.

The software is written in C# using jQuery for the graphical user interface. The graphs and charts are implemented using jqPlot.





Michigan State University
Team Members (left to right)

Hussein Hijazi
Beirut, Lebanon

Anthony Graziosi
Harrison Township, Michigan

Moe Yassine
Dearborn, Michigan

Matthew Rose
Canton, Michigan

Meijer
Corporate Sponsors

Randy Brower
Grand Rapids, Michigan

Adam DeFields
Grand Rapids, Michigan

Scott Pallas
Grand Rapids, Michigan

Dave Rodgers
Grand Rapids, Michigan

Motorola Mobility
Enhanced Content Authoring Services

Today's world is an increasingly interactive one, from the ubiquity of social media to the increasing growth of mobile devices. While traditional content providers struggle with how to utilize these growing social and technological platforms, users demand a much more rich and interactive experience than television currently offers.

Motorola Mobility aims to solve this problem with services that allow content providers to tailor a unique multimedia experience for users and present secondary content to users to enhance their experience.

In the cloud, the Content Authoring Tool (CAT) allows content providers to associate secondary content, such as videos, Twitter feeds, sports statistics, etc., with primary content viewed on the television. With this tool, content providers can easily choose what secondary content to show and the exact point at which it will appear. It allows great flexibility, so that a user viewing the same program multiple times may have a unique experience with each viewing.

On a mobile device, the CompleteTV App presents this secondary content to users, allowing them to interact with what they're viewing in new ways. With either their Apple or Android devices, users will be immersed in secondary content aimed at improving their viewing experience. Whether it's actor biographies, information on a product they have seen, or a video of the best plays of the game, users will be engaged with their televisions rather than just as passive observers.

MOTOROLA

Michigan State University
Team Members (left to right)

Christopher Goad
Grand Rapids, Michigan

Rory Hool
St. Clair, Michigan

Alex Boyd
Sterling Heights, Michigan

Haohan Lin
Zhongshan, China

Motorola Mobility
Corporate Sponsors

Kabe VanderBaan
Libertyville, Illinois

Yan Liu
Libertyville, Illinois

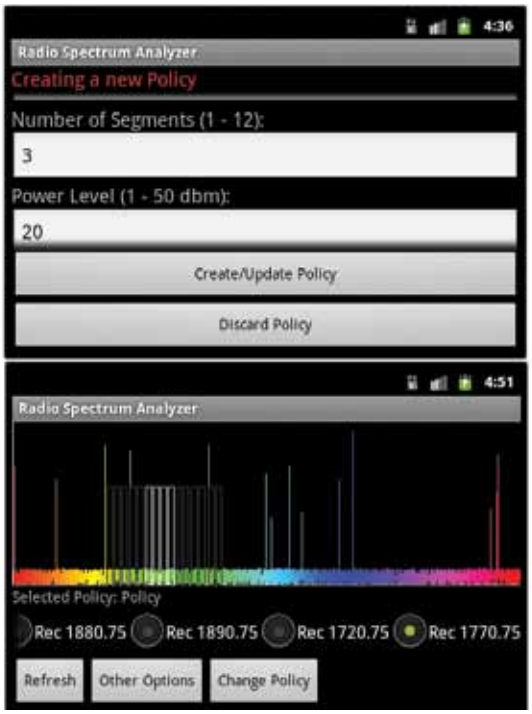
Krunal Shah
Libertyville, Illinois

Raytheon
Dynamic Spectrum Access for Network Radios

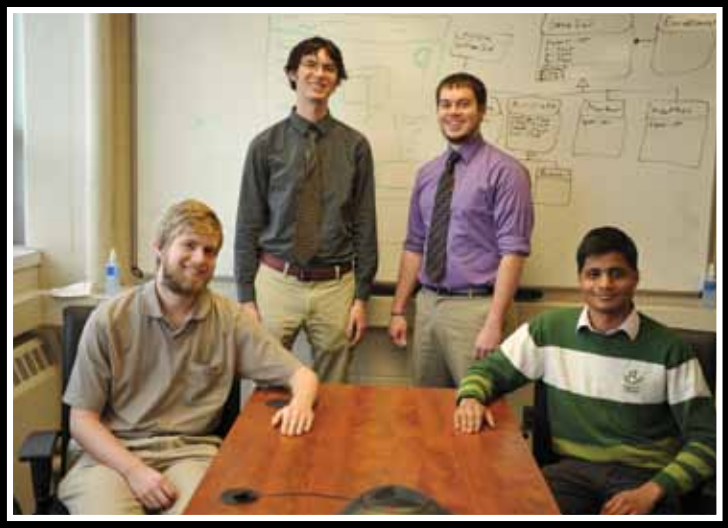
Within militarized regions, reliable radio communication is crucial for coordinating maneuvers between military units. As more radios are used, the radio frequency spectrum becomes crowded with interfering signals. Currently, radio broadcast frequencies have to be manually configured. We have created a program which automates and optimizes this process. This will ensure clear communication in otherwise unusable environments. Our program runs on an Android smart phone which can be connected to a military radio, allowing the entire process to be executed on portable devices.

Our software pulls radio spectra from a military radio. With this data, a decision is made as to what radio frequencies are suitable for transmission. Friendly transmissions which are already in place on the air are detected, allowing the operator to tune into an existing radio network. If the radio operator wants to set up a new transmission on unused airspace, our program recommends a set of radio frequencies over which to broadcast, conforming to some minimal requirements specified by the user. The user can scroll through all available broadcasting recommendations and select one of these recommended frequencies on which to broadcast. Once the new broadcast is set up, other friendly radio operators can identify and tune to this same set of frequencies.

The algorithm used to generate broadcasting recommendations was coded separately from the Android user interface. Raytheon can easily reuse the algorithm's code, allowing for future development of non-Android dependent versions.



Raytheon



Michigan State University
Team Members (left to right)

James R. Voss
Beavercreek, Ohio

William Bonner
West Bloomfield, Michigan

Matt Bowser
Holt, Michigan

Srinivasa Settaluri
Visakhapatnam, India

Raytheon
Corporate Sponsors

Anne-Marie Buibish
Fort Wayne, Indiana

Peter Corsaro
Fort Wayne, Indiana

David Peter
Fort Wayne, Indiana

Jeremy H. Hochstedler
Fort Wayne, Indiana

Daniel Sheline
Fort Wayne, Indiana

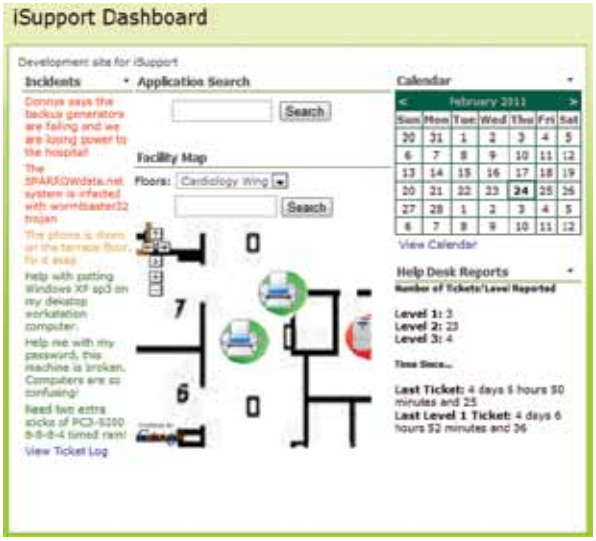
Sparrow Health System
iSupport Center

There are few places in the world where work is a matter of life or death. Sparrow Hospital is one of those few, as mid-Michigan's premier healthcare provider. Working at a hospital requires quick decision making. With the medical world's ever increasing dependence on technology, Sparrow's IT personnel must resolve technical issues as soon as possible. To complete tasks quicker for Sparrow's IT department, we developed an innovative web system called iSupport Center. This integrated dashboard contains tools that employees use to their advantage.

One tool of iSupport Center is to notify employees of incidents. The dashboard screen organizes these open incidents by level of urgency. More details on each assignment can be viewed with one click. Sparrow employees contacted the IT Helpdesk over 60,000 times last year. Finding the necessary information to support one of Sparrow's 400 applications can be overwhelming. iSupport Center includes a search bar to quickly find the application support page. An alert notification can then immediately be sent to the on-call team from the tool.

To show available hardware such as printers and fax machines, iSupport Center includes a dynamic floor plan and hardware map. If any hardware fails, it is indicated on the map with a red marker as opposed to a green marker. Helpdesk support can then redirect employees to the nearest working machine.

The iSupport Center is accessed via any web browser, developed in Microsoft SharePoint 2010 and ASP.NET/C#, with data management in Microsoft SQL Server 2008.



Sparrow

Michigan State University
Team Members (left to right)

Brett McMillen
Clarkston, Michigan

Dianna Kay
Dayton, Ohio

Maurice B. Wong
Grand Rapids, Michigan

Ryan Hewitt
Livonia, Michigan

Sparrow
Corporate Sponsors

Kevin Adler
Lansing, Michigan

Tom Bres
Lansing, Michigan

Scott Carney
Lansing, Michigan

Larry Leasher
Lansing, Michigan

Jami Thering
Lansing, Michigan

TechSmith
WhiteCaps: Mobile Whiteboard Capture Solution

Software developers often use whiteboards to collaborate and document valuable drawings and ideas. These ideas usually end up getting erased or lost. TechSmith came up with a Mobile Whiteboard Capture Solution in which a person can snap a picture of a whiteboard and have that picture automatically saved and organized in the cloud to be easily located later. The goal of this project is to allow TechSmith employees, as well as the general public, to use whiteboards to collaborate and share information more easily.

This project includes a web application as well as mobile applications for the iPhone and Android devices. Users of the mobile app have the ability to take pictures which will automatically be uploaded to the cloud. Users are able to add metadata such as locations, group names, and notes to whiteboard captures. They can organize and share these captures with other users or groups of users. All whiteboard captures and user profiles can be accessed on the web application from either the mobile phone or computer where users can add metadata, annotate captures, search or browse through captures, and manage user groups and profiles.

The web application is developed in C# using the .NET 4.0 framework and Windows Azure SDK. The iPhone application is developed in Objective-C using the iOS SDK, and the Android application is developed in Java using the Android SDK. The application uses Azure Cloud Services for web hosting and data storage.

TechSmith

Michigan State University
Team Members (left to right)

Dillon J. Walls
Ann Arbor, Michigan

Rob Allie
Novi, Michigan

Cassia Miller
Troy, Michigan

Matthew Dobson
Livonia, Michigan

TechSmith
Corporate Sponsors

Dean Craven
Okemos, Michigan

Bill Hamilton
Okemos, Michigan

Mike Simons
Okemos, Michigan

Brandon Thomas
Okemos, Michigan

Urban Science
Bringing LeadVision to the Web

Every day thousands of people go online to shop for a car that suits their lifestyle. For example, two upper class parents might need an SUV to fit themselves and their two children comfortably. They navigate to an automotive manufacturer's website such as AudiUSA.com and request a quote from a local dealership. The dealer responds and starts the sales process with the customer just as if they had walked in the door of the showroom.

Requests such as these leads are routed through Urban Science, an automotive consulting company that enriches customer leads with additional useful data and scores them in an effort to help dealers target the right customers. With so many customer leads, it can be difficult for an automotive company to visualize geographically the locations from where their leads are originating. LeadVision solves this problem by taking those leads and plotting them on a map.

While LeadVision currently only plots leads, the web version will also give the user the option of interacting with the map. Clicking on a vehicle model will filter the map to only show leads for that particular model. Clicking on a geographic area will zoom LeadVision to that particular geography.

The introduction of the new LeadVision system to the web with its manufacturer-agnostic platform provides benefits to corporate employees as well as enabling field representatives and dealerships to create a better connection between any brand and its respective customers.

URBAN SCIENCE

Michigan State University
Team Members (left to right)

William M. Cousins
Northbrook, Illinois

Meredith Schmidt
Grosse Pointe, Michigan

Paul Virag
Livonia, Michigan

Justin Catchens
Oak Park, Michigan

Urban Science
Corporate Sponsors

Brandon Barnett
Detroit, Michigan

Randy Berlin
Detroit, Michigan

Mark Colosimo
Detroit, Michigan

Suzanne Dubois
Detroit, Michigan

Jody Stidham
Detroit, Michigan

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 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 and answer questions to Design Day attendees. Each team plays their project videos and answer 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 Meijer
ITS Products and Services Request System

Matt Packowski, Austin McCarty, Andrew Thielking
Presented by Scott Lake and Bob Buchanan 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 Motorola
Enhanced Program Guides for Mobile Devices

Andrew Rossow, Drew Hanlon, Tim Aubel, Brian Cripe
Presented by Karen Wrobel of Chrysler

Design Day Judges

Scott Carney
Sparrow Health System

Richard Enbody
Michigan State University

Louise Hemond-Wilson
IBM

Kevin Ohl
Michigan State University

Damian Winslow
Dow

David Della Vedova
GE Energy

Adam Haas
Ford

Vandy Johnson
Medtronic

Marty Strickler
Rose Packing Company

Karen Wrobel
Chrysler

TechSmith Screencast Award

TechSmith

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

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

Team Medtronic
Medtronic Wellness Portal

Zach Riggle, Joe Heldt, Chris Van Wiemeersch, Vu Bui
Presented by Dean Craven of TechSmith

Urban Science Sigma Award

URBAN SCIENCE

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 GE Aviation
Super Synoptics

Adam Breece, Shawn Henry Adams, Nick Rafalski
Presented by Randy Berlin of Urban Science

Medtronic

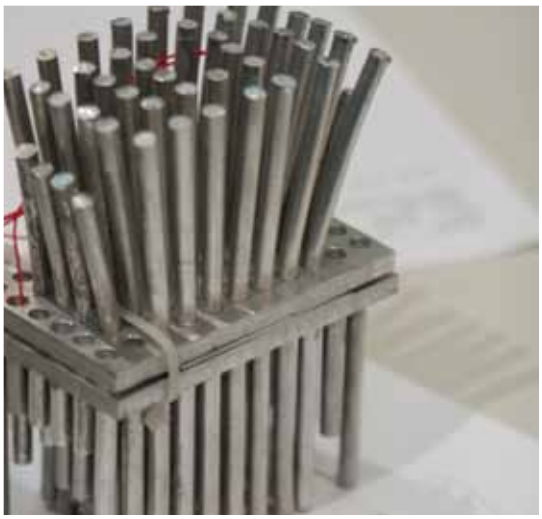
Beyond Imagination

TRANSFORMING TECHNOLOGY TO CHANGE LIVES

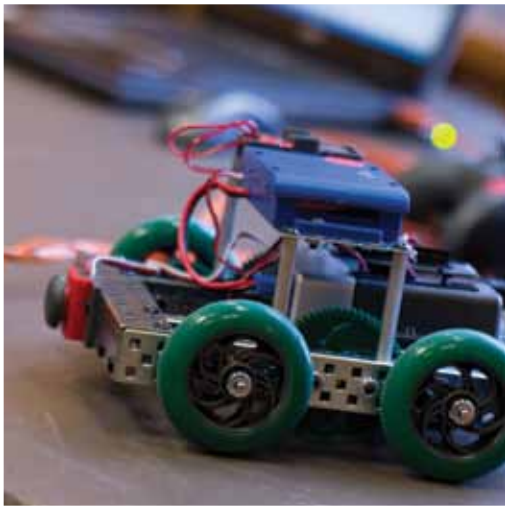
At Medtronic, we're changing what it means to live with chronic disease. We're creating therapies that help patients do things they never thought possible. Seeing our work improve lives is a powerful motivator. The more we do, the more we're driven to push the boundaries of medical technology.

To learn more about career opportunities at Medtronic visit www.medtronic.com/careers.

LinkedIn twitter facebook




Weight of Device (lb.)
Juice Extracted/ Orig. Apple Wt.
.527 .079 .421 .200 .130 .562
Aesthetics (total points /40)
23 13 15 24 21 30




Owners Insurance
Home Car Business

ECE 101

9:30 a.m.–11:00 a.m.
Second Floor
Gold Room A

ECE101 INTRODUCTION TO ELECTRICAL AND COMPUTER ENGINEERING FINAL PROJECTS

Instructor: Dean M. Aslam
Lab Consultant: Sedat Gur

PROBLEM STATEMENT

ECE 101 is an elective course that introduces freshman and sophomore students to Electrical and Computer Engineering through a series of innovative hands-on laboratory experiments. Starting in Spring semester 2011, the ECE 101 has been totally redesigned introducing new experiments linked to new research and teaching areas. These experiments relate to (a) computer switches, (b) building and programming of robots based on MSP430 microcontrollers and NXT LEGO controllers, (c) study of bullying using robots, (d) pH measurement using NXT, and (e) maple-seed robotic fliers (MRF) with onboard MSP430, wireless interface and sensors. After the completion of 8 experiments, the students start working on projects related to the above areas.

Teams and Members

Team 1
Use of NXT for Chemical Mixing and Disposal
Team Members: Jose F. Carmona, Justin Kenton, Mathew Kirk Myers
Description: This project's goal is to build an NXT robot that measures pH values of various chemicals using a pH sensor and sends results to a main NXT controller for proper disposal.

Team 2
NXT Networking and Integration
Team Members: Baylan Anthony, Caroline Kerbelis, Michael Burch
Description: The idea is to create one robot using multiple NXT controllers. This robot will use Bluetooth® to coordinate task completion.

Team 3
NXT Color Tracker Using a Light/Color Sensor
Team Members: Christopher C. Jackson, Erik Heminssen, Yashwant Kondapalli
Description: This project focuses on an NXT robot that tracks lines with different colors. This robot also will be able to tell the color of the line that is being tracked.

Team 4
Guiding A Bully
Team Members: Gerald C. Saumier, Greg D. Dedafoe, Mathew Edward Gilbert-Eyres
Description: In this project, there will be 2 NXT robots: a blind bully and a guide robot. The blind bully robot will be guided through a maze by a guide who knows the path. A negative or positive static charge will be presented by the guide for control.

Team 5
NXT Motion Sensor
Team Members: Ryan Matthew Miller, Steven Anthony Echavarry
Description: The goal is to build a robot that is sensitive to motion and that responds to any motion accordingly.

Team 6
Communication Between a Flying MRF and MRF on the Ground
Team Members: Hayden Fennoy, Terrel J. Wade
Description: This project will focus on establishing a wireless communication between a flying maple-seed robotic flier (MRF) and an MRF on the ground. A data network will be developed using MRFs.

Team 7
NXT Based Terrarium Automation
Team Members: Michael Pechy, John Evankovich
Description: This project will focus on determining the pH of the water, shut off the lights at the right times, use stepper motors to adjust light height compared to the plant height with an ultrasonic sensor.

Team 8
An NXT MRF Thrower and Gearbot
Team Members: Naser K. Akroof, Eric C. Elderer
Description: A Gearbot will be used to trigger an NXT controller which is used to throw an MRF in the air to sense the environment.

ELECTRICAL AND COMPUTER ENGINEERING PROJECTS

PRESENTATION SCHEDULE — Lake Huron Room

Course Coordinator: Professor Michael Shanblatt

Faculty Advisors: Professors Ayres, Deller, Dong, W. Li, T. Li, Shanblatt, Udpa, and Wang

Huron

8:00 a.m. – Noon
Third Floor
Lake Huron Room

Time	Project Sponsor(s)	Sponsor Representative(s)	Faculty Facilitator(s)	Project Title
8:00 ECE 480	Dow Chemical Company and George & Vickie Rock	E. Goodman	L. Udpa	Internet-on-Demand for Rural Schools in Tanzania
8:25 ECE 480	MSU RCPD	S. Blosser	M. Shanblatt	Indoor Digital Orientation Communication and Enabling Navigational Technology
8:50 ECE 480	MSU RCPD	S. Blosser	L. Dong	Doug's Kitchen Robot with Wireless Control Module
9:15 ECE 480	Xilinx	P. Zoratti	T. Li	FPGA Implementation of Driver Assistance Camera Algorithms
9:40–10:00 Break				
10:00 ECE 480	Texas Instruments	P. Semig	W. Li	Over-current Protection: Reference Design and Study
10:25 ECE 480	Texas Instruments	T. Adcock	B. Wang	Stepper Motor ControlCARDs
10:50 ECE 480	Department of Pharmacology & Toxicology	J. Galligan	V. Ayres	Small Animal Barostat Instrument Design
11:15 ECE 480	Cypress Semiconductor	P. Kane	J. Deller	Component for PSoC Creator
11:40 ECE 480	Batelle	C. Ball	W. Li	Smart Phone Control, Data Acquisition, and Data Analysis for Advance Sensor Systems

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 and accommodation issues, and in 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, Marathon Oil, Xilinx, Cypress Semiconductor, Dow Chemical Company, George and Vickie Rock, MSU Department of Pharmacology and Toxicology and Battelle Laboratories.

Dow Chemical Company:
Internet-on-Demand for Rural Schools in Tanzania

Our team is continuing on an ongoing project to bring computers and internet capability to rural schools in Tanzania. Enrollment in schooling has steadily increased in the past several years, but without funding to purchase text books, other methods have to be exploited to get learning materials and information access to these rural areas. One idea has been to provide internet access to the schools. Previous ECE 480 teams have installed solar-powered computer systems at several schools in which one school is directly connected to the Internet by satellite, and the other schools connect to the main school through a wireless network to access the Internet. Electricity is expensive and must be conserved; therefore, when no schools are using the Internet, the satellite and other equipment are to be turned off. Our team's goal is to implement an Internet-on-Demand solution to allow two different schools to access the internet via the satellite and WiFi/WiMax channels at Baraka Primary School. In our proposed approach the remote schools will request Access-to-Internet by sending encoded radio signals to Baraka; the received signal at Baraka is processed by a microcontroller (PSoC) to determine the identity of the school requesting access, and subsequently turns on the satellite access hardware and the communication channel for that school. If no requests are received for a specified interval of time, the PSoC will power off the internet equipment.

http://www.egr.msu.edu/classes/ece480/capstone/spring11/group01/index.html

M. Borton
Computer Eng

N. Donohue
Computer Eng

S. Jackson
Computer Eng

J. Klaser
Electrical Eng

A. Schonschack
Electrical Eng

Prof. Udpa

Prof. Goodman

Project Sponsor
Dow Chemical Company George and Vickie Rock

Sponsor Representative
Prof. Erik Goodman

Faculty Facilitator
Prof. Lalita Udpa

Team Members & Non-Technical Roles
Matt Borton
Manager

Nick Donohue
Webmaster

Jacob Klaser
Documentation Prep

Andrew Schonschack
Presentation Prep

Steve Jackson
Lab Coordinator

RCPD: iDOCENT

Indoor Digital Orientation Communication and Enabling Navigational Technology

The iDOCENT is an indoor navigational smartphone application commissioned by the Michigan State University Resource Center for Persons with Disabilities to guide the visually impaired. It utilizes already existing Wi-Fi access points and maps stored on the MSU Mobile website to locate an individual and route them to a desired location, similar to modern outdoor GPS. This method avoids relying on a true GPS signal which may not always be available inside buildings since satellite signals are attenuated as they travel through walls.

The algorithm works by surveying the current location for available Wi-Fi access points within range, assigning a factor based on signal strength, and performing an averaging calculation using previously documented locations of the access points. This calculated position is then sent to the website to display the position on a map of the building. Step-by-step instructions are then calculated and returned to the smartphone to navigate the user through the building to points of interest while audible feedback assists every move. While the primary purpose of this application is to provide persons with disabilities with more independence, it will prove useful as a tool for assisting visitors or new students at Michigan State. The iDOCENT will be usable by any user with access to a smartphone. This technology will provide a major benefit to the Resource Center for Persons with Disabilities while advancing navigational technologies as a whole.

http://www.egr.msu.edu/classes/ece480/capstone/spring11/group02/index.html

A. Kling
Electrical Eng

G. Stein
Computer Eng

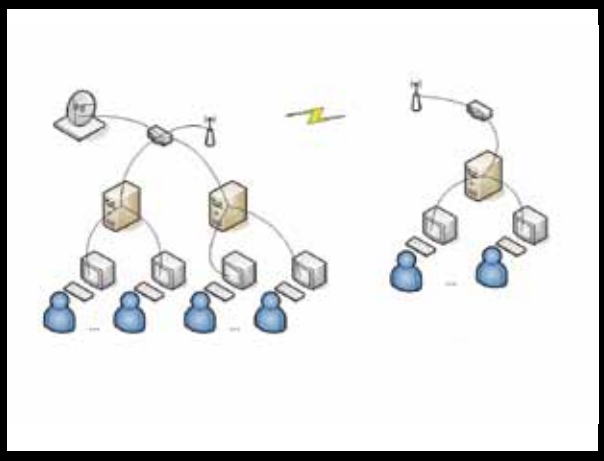
J. D'Onofrio
Computer Eng

M. Gottshall
Computer Eng

RCPD
Maximizing Ability & Opportunity

Mr. Blosser

Prof. Shanblatt



Project Sponsor
MSU Resource Center For Persons with Disabilities

Sponsor Representative
Mr. Stephen Blosser

Faculty Facilitator
Dr. Michael Shanblatt

Team Members & Non-Technical Roles
Gordon Stein
Manager

Jacob D'Onofrio
Webmaster

Matthew Gottshall
Documentation Prep

Andrew Kling
Presentation Prep

RCPD: Doug's Kitchen Robot with Wireless Control Module

The goal of our project was to design and construct a wall mounted robotic arm for a quadriplegic gentleman, Doug, so he can cook in his home independently. The robotic arm is designed to lift heavy pots of water, transport kitchenware, and provide automatic stirring during the cooking process. The arm will be included as part of the design of a new home that is being built according to Doug's needs.

This robotic arm moves in the X, Y and Z directions and a Lexan gripper is attached to the arm to pick up light items such as spatulas. The gripper was designed to be splash proof because it will be exposed to a wet kitchen environment. Metallic hooks are attached alongside the gripper and will be used to lift heavier items. The robotic arm is designed to be operated manually and precisely by Doug.

In addition to the mechanical components of the arm, our team has implemented a wireless interface to control the robotic arm remotely. The wireless controller interface allows Doug more freedom of movement in the kitchen as he might otherwise be tethered to the counter by prominent wires. The controller features three joysticks that are designed for someone with limited hand or arm motion. By sending pulse width modulated signals of different duty cycles, these analog joysticks control the arm at various speeds. The controller has a rechargeable lithium polymer battery that can be recharged using a USB adaptor.

http://www.egr.msu.edu/classes/ece480/capstone/spring11/group03/index.html

T. Manner
Computer Eng

D. Phan
Electrical Eng

A. Alsatarwah
Electrical Eng

K. Yeung
Electrical Eng

RCPD
Maximizing Ability & Opportunity

Mr. Blosser

Dr. Dong

Project Sponsor
MSU Resource Center for Persons with Disabilities

Sponsor Representative
Mr. Stephen Blosser

Faculty Facilitator
Dr. Lixin Dong

Team Members & Non-Technical Roles
Thomas Manner
Manager

Ali Alsatarwah
Webmaster

Ka Kei Yeung
Documentation Prep

Daniel Phan
Presentation Prep
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, such as seatbelts and airbags, technology based active safety mechanisms are being developed and incorporated into all types of commercial and industrial vehicles and may soon be required by law. Current trends are requiring automobile manufacturers to include a multitude of technology based safety equipment including ultrasonic sensors, back-up cameras, and even forward facing cameras. Historically, cameras placed 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 4 has designed and implemented algorithms that will detect and classify objects, allowing the driver to be alerted.

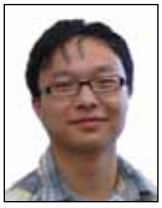
This system draws the driver's attention to objects either behind or in front of the vehicle, by marking them with targets. In doing so, the driver will be less likely to overlook objects that may create a safety hazard. The team has combined the techniques of Histogram of Oriented Gradients (HOG) and Support Vector Machine (SVM) to create a system that will both accurately and efficiently detect and visually alert the driver to hazardous objects. Implementation of the algorithm utilizes Xilinx's Spartan-3A Field Programmable Gate Array (FPGA) development board and Xilinx's System Generator tools.

http://www.egr.msu.edu/classes/ece480/capstone/spring11/group04/index.html

J. Buether
Computer Eng

Meng-Chiao Lee
Electrical Eng

J. Frankfurth
Computer Eng



Kan Xie
Electrical Eng

Dr. Li

Paul Zorratti

Project Sponsors
Xilinx Inc.

Sponsor Representative
Mr. Paul Zoratti

Faculty Facilitator
Dr. TongTong Li

Team Members & Non-Technical Roles
John Buether
Manager

Meng-Chiao Lee
Webmaster

Joshua Frankfurth
Documentation Prep

Kan Xie
Presentation Prep

Texas Instruments: Over-current Protection: Reference Design and Study

Texas Instruments has provided two separate over-current protection applications for this project. The first application monitors the current delivered to the load of a tablet PC and switches off the power delivered if the current drawn from the battery exceeds 1A. The priorities of this application are fast shutoff speed, small circuit size, low power consumption, and low cost. The second application is to accurately monitor the current delivered to the load of a cell phone in order to correctly determine power consumption. The priorities of this project are high accuracy current sensing, minimal system impact, and small circuit size.

Both of these applications use a variety of parts from Texas Instruments such as current shunt monitors, comparators, analog-to-digital converters, power devices, and TI's ultra-low power microcontroller, the MSP430. This project went through the entire design process, from receiving real world customer specifications, to simulating using TI-TINA SPICE, to designing PCB layouts, to finally testing, recording results, and making adjustments as needed.

In addition to designing these applications, various studies were requested by Texas Instruments as a reference for optimizing the accuracy of current sensing applications using TI parts. Since high side current sensing applications use a very low series resistance (mΩ range), placement and connection of this resistance on the PCB is crucial for an accurate result. Experiments were conducted by connecting a current shunt resistor in many different ways, to display how these connections increase or decrease parasitic resistance, and therefore, affect the accuracy of the final output.

http://www.egr.msu.edu/classes/ece480/capstone/spring11/group05/index.html

S. England
Electrical Eng

J. Myers
Electrical Eng

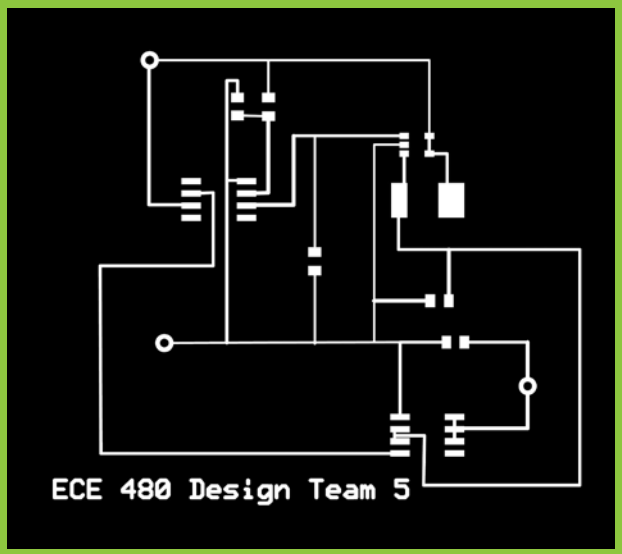
K. Aono
Elec./Comp. Eng

R. Laderach
Electrical Eng

TEXAS INSTRUMENTS

Dr. Li

Mr. Semig



Project Sponsor
Texas Instruments

Sponsor Representative
Mr. Pete Semig

Faculty Facilitator
Dr. Wen Li

Team Members & Non-Technical Roles

Stephen England
Manager

Joshua Myers
Webmaster

Kenji Aono
Documentation Prep

Ryan Laderach
Presentation Prep/ Lab Coordinator

Texas Instruments:
Stepper Motor controlCARDs

Team six's project involves expanding the modularity of Texas Instruments' motor driving evaluation module. Many applications include motors which require drivers and controllers. Team six has been given an evaluation module that has an onboard 16-bit microcontroller. This is used to drive a stepper motor using an integrated motor driver chip.

Team six's design includes removing the microcontroller and its digital counterparts from the evaluation module and replacing it with a dual inline memory module (DIMM) connector. This will allow for multiple DIMM cards (controlCARD) to be inserted into the evaluation module.

A controlCARD containing the 16-bit microcontroller must be designed by team six following Texas Instruments' controlCARD standards. Texas Instruments has designed multiple controlCARDs for the Stellaris family of microcontrollers, and team six is tasked with connecting both the Stellaris and 16-bit microcontroller controlCards to the redesigned evaluation module.

Once both controlCARDs are connected to the redesigned evaluation module they must be coded to work with Texas Instruments' Windows motor control software. This software provides control of multiple motor driving IC's. Team six will have to make changes to the existing 16-bit microcontroller code and also port this code to the 32-bit Stellaris microcontroller.

http://www.egr.msu.edu/classes/ece480/capstone/spring11/group06/index.html

L. Thomas
Computer Eng

P. O'Hara
Computer Eng

T. Volinski
Computer Eng

K. Reece
Computer Eng

TEXAS INSTRUMENTS

Mr. Adcock

Dr. Wang

Project Sponsor
Texas Instruments

Sponsor Representative
Mr. Tim Adcock

Faculty Facilitator
Dr. Bingsen Wang

Team Members & Non-Technical Roles
Leslie Thomas
Manager

Kole Reece
Webmaster

Patrick O'Hara
Documentation Prep

Thomas Volinski
Presentation Prep

Department of Pharmacology & Toxicology:
Small Animal Barostat Instrument Design

The Department of Pharmacology and Toxicology at Michigan State University is currently conducting research to better understand the symptoms and possible treatments of Irritable Bowel Syndrome (IBS). The use of a barostat has been proven to be an effective tool in this field of research. The only model currently available on the market is not an optimal solution for the research team due to its cost ineffective 1990's design. ECE 480 Design Team 7 was tasked with developing an alternative small animal barostat with features comparable to the market equivalent.

The Team 7 Small Animal Barostat Instrument Design is capable of maintaining a constant desired pressure in a gastrointestinal distension balloon for the duration of a distension test. This design uses a simple, user-friendly interface to allow complete control over test parameters. The front panel display is capable of displaying test parameters and conditions during and after a distention test.

Lab testing with the Michigan State University Department of Pharmacology and Toxicology shows that this device is capable of improving the results of distension testing by effectively eliminating human error during the testing process.

http://www.egr.msu.edu/classes/ece480/capstone/spring11/group07/index.html

J. Scott
Electrical Eng

C. Knowles
Electrical Eng

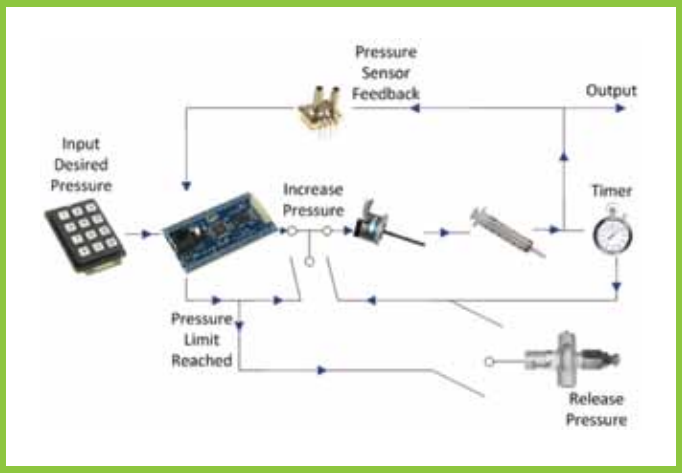
T. Gordon
Electrical Eng

C. Davidson
Electrical Eng

Department of
Pharmacology
& Toxicology

Dr. Galligan

Dr. Ayres



Project Sponsor
Department of Pharmacology and Toxicology

Sponsor Representative
Dr. James J. Galligan

Faculty Facilitator
Dr. Virginia Ayres

Team Members & Non-Technical Roles
Jacob Scott
Manager

Thomas Gordon
Webmaster

Casey Davidson
Documentation Prep

Cody Knowles
Presentation Prep

Cypress Semiconductor:
ZigBee Component for PSoC Creator

Our design team is working with Cypress Semiconductor to create a wireless component for their PSoC Creator software package. A PSoC (programmable system-on-chip) is an integrated circuit that is capable of performing a wide range of analog, digital, and mixed signal functions. This project will demonstrate these functionalities in an effort to show the versatility of a PSoC.

The wireless network is established by using XBeePRO radios that implement the ZigBee protocol. The radios and protocol are designed to work efficiently with low power consumption. They also operate in the 900MHz range which is ideal for communications that can penetrate walls and other objects that may interfere with the radio signals.

In the beginning of the design flow the PSoC will be used for data acquisition. Data such as power consumption, temperatures, or motion from a sensor is received by the PSoC and converted to digital signals. These digital signals are then packaged so that the XBee radios can receive and transmit the data. Once the data is received on the other end, the XBee radio will pass the information to another PSoC for processing. In the final stage the PSoC transmits the data to a computer via a USB interface.

This process will be packaged for PSoC Creator so that customers can implement this functionality by following a simple tutorial on the Cypress website.

http://www.egr.msu.edu/classes/ece480/capstone/spring11/group09/index.html

J. Flynn
Computer Eng

R. Klavon
Computer Eng

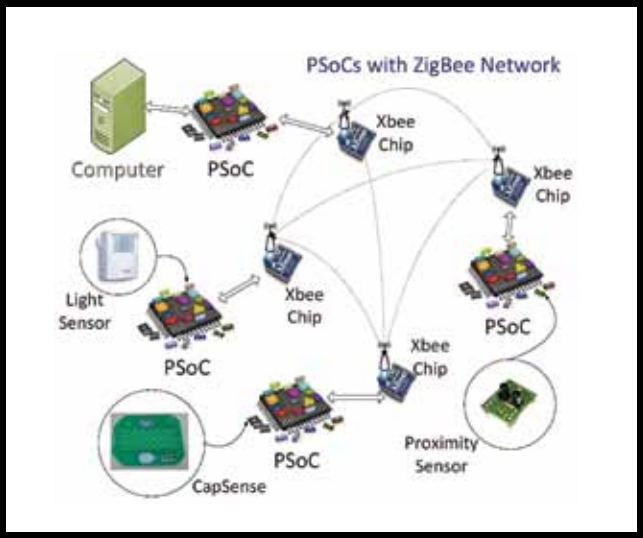
J.D. Michoski
Computer Eng

K. Micinski
Computer Eng

CYPRESS PERFORM

Dr. Deller

Mr. Kane



Project Sponsor
Cypress Semiconductor

Sponsor Representative
Mr. Patrick Kane

Faculty Facilitator
Dr. John Deller

Team Members & Non-Technical Roles
Justin Flynn
Manager

JD Michoski
Webmaster

Rachel Klavon
Documentation Prep

Kris Micinski
Presentation Prep

Battelle: Smart Phone Control, Data Acquisition, and Data Analysis for Advance Sensor Systems

Team 10 is sponsored by Battelle, a research and development organization that addresses the pressing needs of government and industry. Battelle is seeking to develop the use of smart-phone technologies in controlling operations of advanced sensor systems. Smart phones potentially can replace onboard, embedded systems that add complexity, cost, size, and power constraints in the engineering of these sensor systems. Our team aims to provide the sponsor with a comprehensive analysis of current smart phones and their capabilities of transferring and analyzing complex data, as well as any impacts future advances in hardware and software may have on this functionality. The team will also work on creating the necessary applications to remotely control a stand-in sensor so that we can both evaluate how current devices perform at such a task and accurately measure the effects on the phone's resources, especially battery life, memory and processing speed.

http://www.egr.msu.edu/classes/ece480/capstone/spring11/group10/index.html

A. Moss
Computer Eng

J. Patel
Electrical Eng

K. Hsu
Computer Eng

N. Arora
Electrical Eng

R. Sinha
Computer Eng

Battelle
The Business of Innovation

Dr. Ball

Prof. Li

Project Sponsor
Battelle

Sponsor Representative
Dr. Christopher Ball

Faculty Facilitator
Dr. Wen Li

Team Members & Non-Technical Roles
Nitin Arora
Manager

Kenneth Hsu
Webmaster

Ashanta Moss
Documentation Prep

Jeet Patel
Presentation Prep

Ravi Sinha
Lab Coordinator

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.

Design Day Awards:

MICHIGAN STATE UNIVERSITY COLLEGE OF ENGINEERING

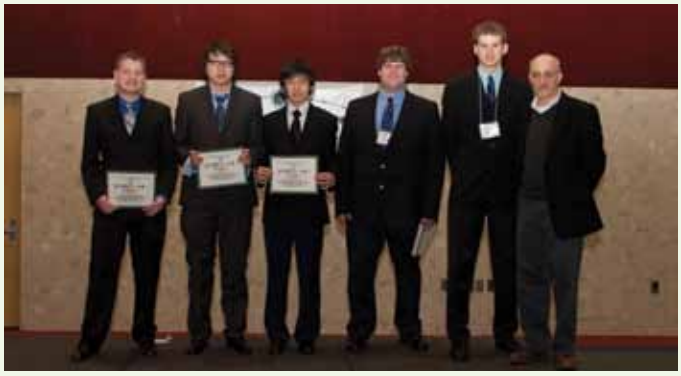
Electrical & Computer Engineering Prism VentureWorks Prize & Winners, Fall 2010

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.

First Place: Team #5 – Hyundai-Kia America Technical Center: Automobile Headlamp Switching Using Smart Glass

LEFT TO RIGHT:
S. Udpa, K. Lee, S. Gotch, B. Greetis, H. Song, E. Martin, R. Austin, M. Shanblatt

Second Place: Team #2 – Accessible Manufacturing Equipment, Phase 2 (Sponsor: Texas Instruments)



LEFT TO RIGHT:
N. Neumann, L. Tian, F. Adisaputra, R. Prewett, J. Brouker, M. Shanblatt

Third Place: Team #3 –Xilinx: FPGA Implementation of Driver Assistance Camera Algorithms

LEFT TO RIGHT:
T. Ganley, J. Olsen, T. Eckles, E. Kuhn, F. Dembele, P. Grant, M. Shanblatt

Design Day Awards:

MICHIGAN STATE UNIVERSITY COLLEGE OF ENGINEERING

Electrical & Computer Engineering Capstone Poster Award & Winner, Fall 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 Days, based on their appeal and effectiveness in communicating the project goals and achievements. A prize of $1000 is awarded to the most outstanding team.

Team #1 – Accessible Smart Grid Ready: Wheelchair Battery Charger

LEFT TO RIGHT:
S. Udpa, B. Boozer, C. Payne, M. Waligorski, K. Jackson, A. Humphreys, M. Shanblatt

aeemsu.com

AEE

audio enthusiasts and engineers

Design Day:
April 29th, 2011
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.

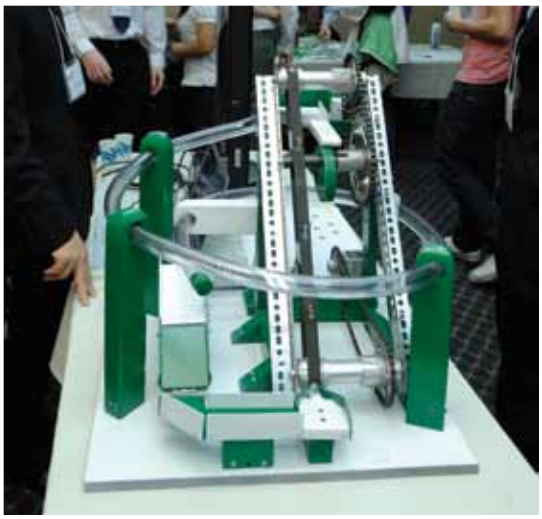
TUBE AMPS
This semester the Tube Amp Team built a variety of guitar amplifiers. Those involved in the Tube Amp Team quickly become knowledgeable about reading schematics, component layout, grounding and especially soldering.

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

Whirlpool Corporation, a *FORTUNE* magazine Top 15 Global Company for Leaders, employs more than 150 Michigan State University graduates and is a proud sponsor of College of Engineering Design Day.

For more information about our full-time and internship programs in Engineering and to join our global Engineering team, visit:
www.WhirlpoolCareers.com


HOLT



Mechanical Engineering Design Program

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
Asif Nasar, The Boeing Company
Jim Wilde, Beijing West Industries Co. Ltd.

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, Chrysler Group, LLC, Dow Chemical Company, Ford Motor Company, General Motors Company, The Kellog Company, Louis Padnos Iron & Metal Company, MSU Center for Orthopedic Research, OG Services, Pepsi Beverage Company, Shell Oil Company, Student Alumni Association, U.S Air Force Small Engine Research Laboratory

Design Day Awards:

MICHIGAN STATE COLLEGE OF ENGINEERING

Mechanical Engineering: Thomas Alva Edison Undergraduate Design Award

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

l-r: Prof. Clark Radcliffe presenting to Kyle Bateman Adrienne Burger John Schultz Alexander Douglas and Jeff Holley

FALL 2010 ME 481 EDISON UNDERGRADUATE DESIGN AWARDS

Kyle Bateman
Adrienne Burger
Alexander Douglas
Jeff Holley
John Schultz

ME 481 Oral Presentation Award

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

l-r: Prof. Clark Radcliffe presenting to Pete Redente Ben Nutsch Jack Johnson and Matt Pung

FALL 2010 ME 481 ORAL PRESENTATION AWARDS

Jack Johnson
Ben Nutsch
Matt Pung
and Pete Redente

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.

l-r: Prof. Radcliffe presenting to Adam Blumerich Mark Goldy Mark Holmes and Ross Loynes

FALL 2010 ME 481 POSTER PRESENTATION AWARD

Adam Blumerich
Mark Goldy
Mark Holmes
Ross Loynes

Design Day Awards:

MICHIGAN STATE COLLEGE OF ENGINEERING

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: Nick Righetti Sarah Stoner Mike O'Brien Alex Danaj with Dr. Scott Kiefer presenting the award

FALL 2010 ME 471 MACHINE DESIGN AWARD

Alex Danaj
Mike O'Brien
Nick Righetti
and Sarah Stoner

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.

Jeff Holley, Alexander Douglas, John Schultz with Dr. Laura Genik presenting the award

FALL 2010 ME 412 HEAT TRANSFER DESIGN AWARD

Alexander Douglas
Jeff Holley
and John Schultz

ME 371 Mechanical Design I Kids' Choice Award

The pre-college students participating in Design Day vote for the most outstanding ME 371 project. The winning team is designated as the 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: Dean Satish Udpa, Matthew Malek, Peter Schultz, Jeffrey Klegon, Thomas Klotzbach and Prof. Brian Thompson presenting the award

FALL 2010 ME 371 KIDS' CHOICE AWARD

Jeffrey Klegon
Thomas Klotzbach
Matthew Malek
and Peter Schultz

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

INSTRUCTOR: Professor Farhang Pourboghrat

ME 371

9:00 a.m.– Noon
Second Floor
Parlor A

PROBLEM STATEMENT

Teams of students were required to design and manufacture mechanisms that would thrill an audience of pre-collegiates. 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 *Sparty 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
Mark Davison
Matt Hoffdal
Jonathan Lusczakoski
Christopher Matthes

Team 2
Jayson Blough
DeAnna Doan
Joshua Hill
Pat O'Malley

Team 3
Andrew Grossman
Jarrod Heck
Karl Krug
Charles Maines
Benjamin Wilburn

Team 4
Erika Crosby
Michael Mehall
Khoa Nguyen
Megan Wallace

Team 5
Michael Aurino
Peter Bentley
Jonathan DiClemente
Justin Mrkva

Team 6
Raid Alaswad
Kyoungho Kim
Peter Schall
Kyle Schubel

Team 7
Cameron Gibson
Rebecca Hannon
Nick Schooley
Scott Smith

Team 8
Alex Bergquist
Matt Gorman
Mark Hoyer
Matt Witmer

Team 9
Raul Maghiar
Andrew Mozer
Trevor Shane
Jared Staubin

Team 10
Stephen Campbell
Haley Orr
Russ Tindall
Michael Trotter

Team 11
Ben Ambrose
Kevin Andreassi
Matthew Bur
Kevin Svacha

Team 12
Shannon Beard
Jordan Bowman
Samantha Hilk
Drew Kristufek

Team 13
Blaine Benson
Marcus Cannon
Brandon Smith
Brady Thom

ME 412

9:00 a.m. –11:20 a.m.
Second Floor Ballroom

SOLAR HOT AIR BALLOON

INSTRUCTOR: Dr. Laura J. Genik

TA Staff: Michael Farmer, Vahid Mirjalili, Christopher Paul, Andrew Vander Klok

The possibility of flight has always been fascinating and is of great practical importance. The creation of a flying device powered only by sunlight would be very useful but there must be little cloud cover and plenty of sunlight. Joseph and Jacques-Ètienne Montgolfier in 1783 France began using buoyancy forces in a hot air balloon to fly. And the Montgolfière was born. The ability of the Montgolfière to stay aloft depended greatly on the temperature of the air within the balloon, which reduced its usefulness for other than recreational purposes. More recently, in March 1999, Bertran Piccard of Switzerland and Brian Jones of Britain circumnavigated the globe in a non-stop flight in a hot air balloon. Balloons are not very effective flying devices but they are useful to lift a payload that requires little control/guidance high into the atmosphere (e.g. weather balloons). Such balloons often use an inert gas to become buoyant. Very recent successful flights have been made with solar Montgolfiere balloons. Such balloons are for very high altitude (longest flight 69 days). Solar Infrared Montgolfiere Aerobots (SIRMAS) use a combination of lower planetary infrared heating during the night and solar heating during the day. NASA is studying these for use on various planets.

The ME 412 design project will look at efficient ways of converting solar energy into heated air that will then provide buoyancy to lift a payload.

PROBLEM STATEMENT

The project team is to design, analyze, build, and test a hot air balloon that will float with the assistance of sunlight only (or an equivalent source). The device will begin at room temperature and there are no restrictions on size; however, no part of the balloon may be closer than 45 cm to the heat source. The objective will be to maximize the weight of a payload that can be lifted by the balloon, as well as to minimize the time to become airborne. A device must be manufactured by the project team. To test the device, two infrared lamps that provide approximately 500 W will be used.

TIME	DESIGN TEAM
9:00 a.m.	Peter Anthony, Andre Chanyawatanakul, David Goshgarian
9:00 a.m.	Thomas Dennis, Michael Fetter, Brian Gilkey
9:00 a.m.	Alexander Hsieh, Brian Jansen
9:20 a.m.	Kevin Compau, Ian Forney, Adam Rainbolt
9:20 a.m.	Benjamin Cherwinski, Hasib Mohammed, John Schiefer
9:20 a.m.	Tao Han, Nicholas Mimikos, Joseph Wesorick
9:40 a.m.	Rachel Maurer, Charles McGovern, Jeremy Racine
9:40 a.m.	Trevor DeLand, Katelin Friederichs, Matthew Wolfe
9:40 a.m.	Joseph Bickham, Nathan Geib, Brandon Gray
10:00 a.m.	Kylar Dailey, Christopher Lutz, Andrew Starck
10:00 a.m.	Theodore Belanger, Nicholas Righetti, Sarah Stoner
10:00 a.m.	Kyle Kocarek, Eric Massa, Justin Raymond
10:20 a.m.	Jon Petersen, Kyle Spiekermann, Erik Sundberg
10:20 a.m.	Manila Ounsombath, Allison Ridder, Kyle Urban
10:20 a.m.	Luis Alvarez, Michael Conboy, Stephen Santavicca
10:40 a.m.	Michael Douglass, Nicholas Stuart, Sara Wiederoder
10:40 a.m.	Brent Ewald, Andrew Kappler, Lindsay Smith
10:40 a.m.	Matthew Flis, Jordan Smart, Corrie Zitkus
11:00 a.m.	Jarreau Jackson, Chad Payne
11:00 a.m.	Nicholas Huehl, Saad Khan, Amar Shah
11:00 a.m.	Harold Hill, Jelena Paripovic, Manpreet Singh

MECHANICAL DESIGN II
AIR CARGO LIFT

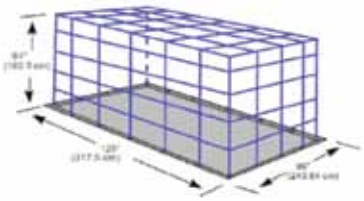
INSTRUCTOR: Professor Gaetano Restivo

ME 471

9:00 a.m. – 11:00 a.m.
Second Floor
Ballroom

PROBLEM STATEMENT

The teams were asked to design a lift mechanism for air cargo shipping containers. The lift must fit two standard PMC air cargo containers, as depicted in the figure below (taken from Delta.com website), which includes dimensions and weight. The loading/unloading heights are 1 meter (low), and 5 meters (high). Students will present their designs, simulations and scale prototypes.



Container Volume:	745 cu.ft./21.2 cu.m.
Max Gross Weight:	11,100 - 15,000 lbs 5,035 – 6,804 kgs
Dimensions [LxWxH]:	125 x 96 x 64 in 318 x 244 x 163 cm
Aircraft Type:	B777, B747, B767, A330

Students challenged by the project include:

Khalifa Saeed Almansouri
Joshua David Baack
Nilutpol Basumatari
Theodore Daniel Belanger
Joseph Robert Bickham
Andrew Mario Binell
Rachel Ashley Bogle
Kenneth Brian Bowman
Christopher G. Chorny
Sarah Marie Chrustowski
Andrew Joseph Cooper
Scott Alexander Coy
Taylor Evans Darling
Erik Jon Durfee
Alan Josef Finder
Matthew Alan Fisher
Ian Bryant Forney
Bobby Dean Fuentes
Brandon A. Gandy
Gerald Raymond Gentz
Samuel Harris Goodsitt
Scott James Hall
Anthony James Han
Katherine S. Hilton
Jarreau Richard Jackson
Tyler Anson Jaynes
Nur Azan Joned
Paul Charles Jurcak
Kyle Blaine Justus
Mardan Namic Kerimov
Jeffrey Henry Klegon
Taryn Jean Klinkner
Thomas Jacob Klotzbach
Peter N. Koenigsknecht
Nick Eric Kuuttila
Matthew Paul Lempke
Ryan William Lureau
Camille Janey McCall
Brandon Scott Miller
Robert O. Mishkin
Andrew Michael Nuttall
Michael Joseph Olsztyn
Matthew Francis Pawlicki
Peter Eric Petersen
Joshua Michael Racalla
Joseph Andrew Ray
Ryan Michael Sanback
Peter Joseph Schultz
Mark Gregory Shuptar
Andrew W. Stuckwisch
Joshua Joseph Talaga
Gregory J. Tenbusch
Brian Leon Tew
Gregory Julian Thomas
Thomas M. Vacketta
Jeffrey Paul Vanandel
Douglas M. Vanmeter
Seth Adam Wald
Nicholas Allan Wilson
Michael Lee Wong
Shawn Robert Wright

ME 481

8:00 a.m. – Noon
Third Floor
Lake Superior Room
and Fourth Floor
Tower Room

MECHANICAL ENGINEERING PROJECTS

PRESENTATION SCHEDULE — Lake Superior and Tower Rooms

Course Coordinator: Professor Clark Radcliffe

Faculty Advisors: Professors Bénard, Brereton, Feeny, Khalil, Kwon, Loos, Naguib, Shaw, Thompson and Wright

Lake Superior Room

Time	Project Sponsor(s)	Professional Advisor(s)	Faculty Advisor (s)	Project Title
8:00 a.m.	U.S. Air Force Small Engine Research Laboratory	T. Lee B. Thelen	A. Naquib	A Flexible Test-bed for Optimization of a Small Scale Engine Ignition
8:25 a.m.	OG Services	G. Shedrick	P. Kwon	The Interchangeable Bottle and Cap
8:50 a.m.	MSU Center for Orthopedic Research	N. P. Reeves	B. Feeny	Force Neuromuscular Control of the Head
9:15 a.m.	Student Alumni Foundation	D. DiMaggio B. Hatala	H. Khalil N. Wright	The "Cool Sparty" Project
9:40 a.m.	Louis Padnos Iron & Metal Company	C. Schrotenboer	G. Brereton	Compressed Air Bar System
10:00 a.m.–10:20 a.m. Break				
10:20 a.m.	The Kellogg Company	E. Keene K. Ullrey	N. Wright	Portble Dry Steam Cleaning System
10:50 a.m.	The Kellogg Company	E. Keene K. Ullrey	G. Brereton	Electrostatic Charging of Materials
11:15 a.m.	Marvin E. Beekman Center Shell Oil Company	C. Jorgensen	B. Thompson	Adapted Seating Fore the Course
11:40 a.m.	Woodcreek Elementary School Shell Oil Company	D. Graham	B. Thompson	Solar Heated Vermicomposting Bin

Tower Room

8:00 a.m.	American Hydromech	T. Droste	A. Loos	Electric Motor Driven Vacuum pump – Benchmark Study
8:25 a.m.	Pepsi Beverages Company	E. Curtis	S. Shaw	Mechanical Layer Picking Design for Shell Handling
8:50 a.m.	Chrysler Group LLC	J. Badgley S. Bittinger	A. Naguib	Minivan/SUV Seat Feature Future Needs
9:15 a.m.	Dow Chemical Company	A. Alderman	A. Loos	External Basement Insulation Paneling
9:40 a.m.	Dow Chemical Company	M. Rokosz	A. Loos	Interior Basement Insulation Panel
10:00 a.m.–10:20 a.m. Break				
10:20 a.m.	Ford Motor Company	S. Bohr	A. Naguib	GTDI Evaporative System Design Project
10:50 a.m.	Ford Motor Company	R. Pearce	N. Wright	Hybrid Electric Vehicle Evaporative Emissions System
11:15 a.m.	General Motors Company	A. Herman	A. Bénard	Redesigned Battery Seal Strategy for the Chevrolet Volt
11:40 a.m.	Heartwood School Shell Oil Company	J. Janicki	B. Thompson	Sensory Garden Bridge

USAF (SERL):
A Flexible Test-bed for Optimization of a Small Scale Engine Ignition System

This project is sponsored by the SERL (Small Engine Research Laboratory) at the Wright Patterson Air Force Base in Dayton, Ohio. SERL conducts research for small scale engines (1-10hp) and next generation propulsion systems, including non-equilibrium plasma discharge and performance for Unmanned Aerial Systems (UASs – drones). These drones are a popular alternative for reconnaissance missions because drones do not endanger human life. Although current drones have high maneuverability, there is a further need to develop the small engines that power these drones. The Air Force is specifically looking into non-equilibrium plasma discharge to solve this problem. This new development will be able to push the future drones to performance limits that current traditional engine systems cannot achieve.

The latest development of non-equilibrium plasma discharge has provided more opportunity in improving ignition systems in many areas. In order to test these types of systems, a new compatible test apparatus must be developed since no current facilities are suitable.

The project proposed by the SERL was to design and assemble a comprehensive test-bed for small scale engines with the ability to monitor engine performance such as power, torque, fuel consumption and chamber pressure. The test-bed must accommodate multiple engine mounting configurations with tight tolerances and quick turnaround between tests.

The challenge was met by developing a number of different design concepts. The finished test-bed was designed to provide safety, manufacturing assembly and tooling, quick turnaround time, flexible configurations, structural integrity, and visual appeal.

U.S. AIR FORCE

The greatest challenges that were overcome…

- Blast shield design (accessible door)
- Mounting configuration (coupling alignment from dynamometer to engine)
- Manufacturing assembly and tooling

…The Small Engine Research Laboratory Student Design Team

Dr. Lee

Prof. Naquib

The design of a flexible test-bed which can accommodate a wide range of small scale engines and advanced ignition systems will enable the testing and optimization of a new generation of advanced propulsion systems for unmanned aerial systems (UASs) in the Air Force. The ability to test new ignition systems will result in advanced engines which are capable of integrating a wide range of alternative and renewable fuels as well as dramatic improvement in thermal efficiency and power output.

Dr. Tonghun Lee

Project Sponsor
Small Engine Research Laboratory
Wright-Patterson AFB
Dayton, Ohio

Professional Advisors
Dr. Tonghun Lee
Bryce Thelen
(not pictured)

Faculty Advisor
Prof. Ahmed Naquib

Team Members and Home Towns
Garrett Kerns
Saginaw, Michigan

Curtis Mumaw
Grosse Pointe, Michigan

Joseph Rotellini
Northville, Michigan

Stephen Santavicca
Macomb, Michigan

OG Services: The Interchangeable Bottle and Cap

O.G. Services, a company created by Glenn Shedrick, is striving to find a solution to a problem that many Americans face daily. While using products packaged in a container utilizing a pump function, a significant amount of the product always remains unreachable by the pump. Thus, consumers either throw away valuable product or resort to finding a timely solution to retrieve the remainder of the product from the bottom of the container. Shedrick wishes to create a bottle that incorporates a pumping mechanism with an interchangeable cap that attaches to the bottle for a quick switch when the pump becomes obsolete in dispensing the solution.

Glenn Shedrick received his undergraduate degree in marketing from Saginaw Valley State University. Later he attended graduate school and obtained his MBA from Baker College. He hopes that his innovative idea will interest packaging companies and make the lives of pump bottle users a little bit easier.

...The OG Services Student Design


Prof. Kwon


Mr. Shedrick

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

Mr. Glenn Shedrick
O.G. Services

Project Sponsor
O.G. Services
Saginaw, Michigan

Professional Advisor
Mr. Glenn Shedrick

Faculty Advisor
Prof. Patrick Kwon

Team Members and Home Towns
Manila Ounsombath
Lansing, Michigan

Allison Ridder
Latrobe, Pennsylvania

Kristin Steinmetz
Rochester, Michigan

Kyle Urban
Jenison, Michigan

MSU Center for Orthopedic Research:
Force Neuromuscular Control of the Head

The MSU Center for Orthopedic Research conducts leading edge research to better understand neuromuscular control. It studies the effects of pain, discomfort, and disease on the body's neuromuscular and skeletal performance. Because so many people suffer from neck pain, the MSU Center for Orthopedic Research is interested in studying the forces exerted by individuals with and without neck pain. This project involves the designing and constructing of a system that will track the force generated for neuromuscular control of the head as it performs target tracking tasks.

To successfully develop a new method to assess force neuromuscular control of the head, two separate components were explored. A seat was designed to fit a large range of the population. This seat was equipped with a harness that would independently restrain the subject's torso and head without inflicting harm. Additionally, the head harness was equipped with a load cell to measure the forces exerted in 3 degrees of motion.

The second major portion of the project was to connect the load cell to a data acquisition system so that the force exerted by the head controls a cursor on the screen. The patient's goal is to follow a moving target on the screen with that cursor. Different softwares were investigated to determine that which was most compatible to display a moving target and which would have the capabilities to control a cursor.

Working with the MSU Center for Orthopedic Research, the design team has designed and built a system that will accurately and precisely assess force neuromuscular control of the head.

...The MSU Center for Orthopedic Research Student Design Team

Dr. Reeves

Prof. Feeny

There is growing evidence that people with neck pain have impaired neuromuscular control of the head. Future research studies will use this new method to understand the mechanism for neuromuscular impairment in the neck pain population and evaluate the efficacy of treatment options

Dr. N. Peter Reeves
MSU Center for Orthopedic Research

Project Sponsor
MSU Center for Orthopedic Research
Lansing, Michigan

Professional Advisor
Dr. N. Peter Reeves

Faculty Advisor
Prof. Brian Feeny

Team Members and Home Towns
Ben Cherwinski
Flushing, Michigan

Trevor DeLand
Monroe, Michigan

Jelena Paripovic
East Lansing, Michigan

Jeremy Racine
Shelby Twp., Michigan

Student Alumni Foundation:
The "Cool Sparty" Project

The Student Alumni Foundation (SAF) strives to unify Michigan State University (MSU) students and alumni by providing programs and events that foster Spartan spirit. The SAF organizes student sections such as the IZZONE (men's basketball) and Slapshots (men's hockey) while also providing networking opportunities through the Alumni Engagement Program. The appearances of Sparty, MSU's beloved mascot, are managed by the SAF through the Sparty Mascot Program.

Sparty participates in sporting events and a number of on- and off-campus activities including parades, fundraisers, and weddings. During the summer months and Sparty's more active appearances, the temperature inside the Sparty costume can reach approximately 30 degrees above the room temperature. Numerous health risks are associated with prolonged heat exposure such as dehydration, heat stroke, and heat exhaustion. The goal of the project is to develop a cooling system that will provide a more comfortable and safer environment for the student portraying Sparty. The system allows Sparty to perform for longer time periods without altering the appearance or mobility.

The design team researched different cooling systems and performed heat transfer and thermoelectrical analysis to determine the optimal design. A prototype was manufactured, tested, and implemented. Through the collaboration of the SAF and the mechanical and electrical engineering design team, a final design that optimizes cooling performance while minimizing weight and cost was developed.

...The "Cool Sparty" Design Team


Mr. Dimaggio


Prof. Khalil


Mr. Hatala


Prof. Wright

The "Cool Sparty" Project will positively impact the Sparty Mascot Program by providing the student portraying Sparty a safer, more comfortable "in-suit" experience. In-suit temperatures range from 25-30°F warmer than surrounding/room temperatures. The proposed system could potentially allow Sparty to attend appearances during warmer months or indoors for longer periods of time. Our main goal is to lower the temperature inside the core of the costume to improve safety without altering external appearance.

Mr. Dan DiMaggio
Director
Student Alumni Foundation

Project Sponsor
Student Alumni Foundation
East Lansing, Michigan

Professional Advisors
Mr. Dan DiMaggio
Mr. Ben Hatala

Faculty Advisors
Prof. Hassan Khalil
Prof. Neil Wright

Team Members and Home Towns
Maitham Aleid
Qatif, Saudi Arabia

Ashley Kulczycki
Troy, Michigan

Brian Rockwell
Houston, Texas

Nicholas Stuart
East Lansing, Michigan

Diana Toan
Wyoming, Michigan

Ahmad Zahid
Riyadh, Saudi Arabia

Louis Padnos Iron & Metal:
Compressed Air Bar System

Recycling is a very important part of today's world as basic resources become harder and harder to find. Recycled material is also cheaper in most cases than mining raw material. Louis Padnos Iron & Metal strives to efficiently recycle all of the material it possibly can. The recycled material is shredded in mass quantities for efficiency, and because of this the sorting of the material is both difficult and essential. Louis Padnos Iron & Metal has teamed up with MSU's senior design program in order to make the sorting process more efficient, in terms of both speed and material recovered.

The team has been given the task of designing a working prototype of an air pressure powered material separation device. It is to be fitted to a non-ferrous shredded material line where it must divert selected types of metal onto another line.

Louis Padnos Iron & Metal currently uses a mechanical paddle sorting system controlled via induction sensors and a computer system. In order to improve accuracy, they have requested smaller lane sizes that are only possible using a pneumatic system. The lane sizes will be reduced by 75%. This results in a greater accuracy of material recovery, which equates to not only a considerable increase in revenue, but a significant reduction in material sent to landfills.

The air pressure system includes four main components: an air compressor, a plenum, solenoid valves, and an air bar manifold. The device is to be fitted to the existing computer control system, which selects certain materials and ejects them onto a desired conveyor. The material stream moves very quickly, so the design must have extremely quick reaction times to maintain accuracy.

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

PADNOS
SINCE 1905

Mr. Schrotenboer

Prof. Brereton

Development and proper design of a compressed air diversity system will allow us as a recycling company to be able to further separate and recover additional materials from the recycled products stream. This in turn allows for a more sustainable operations platform for our recycling company.

Mr. Craig Schrotenboer
Louis Padnos Iron & Metal Co.

Project Sponsor
Louis Padnos Iron & Metal Company
Holland, Michigan

Professional Advisor
Mr. Craig Schrotenboer

Faculty Advisor
Prof. Giles Brereton

Team Members and Home Towns
Andrew Armstrong
Rochester Hills, MI

Matthew Flis
Dearborn Heights, MI

Ahmed Mohamed
Cairo, Egypt

Jordan Smart
Grand Haven, MI

Corrie Zitkus
Troy, MI

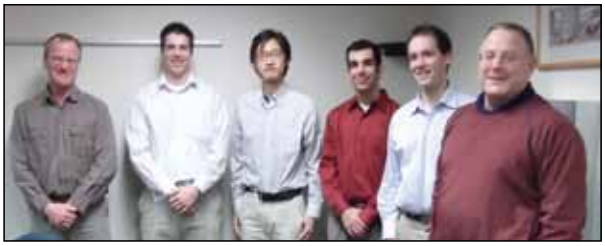
Kellogg's: Portable Dry Steam Cleaning System

Kellogg's is the world's leading producer of cereal and a global leader in convenience food production, selling their products in more than 180 countries. The quality of Kellogg's food and success of its business are based on its maintaining efficient and safe operations in its production plants.

Employees of Kellogg's strive to efficiently produce safe, high quality foods for consumers. In order to maintain clean equipment and safe food, it is necessary to execute proper sanitation procedures. Additionally, a plant environment is always subject to requirements of increasingly efficient processes, and Kellogg's cleaning procedures are no exceptions. Kellogg's operations rely on the time it takes to clean equipment while avoiding speed cleaning and reducing chemical agents that affect the quality of food.

Kellogg's originally implemented a dry steam cleaning unit that converts tap water to dry steam into the plant's cleaning procedures. This project consists of developing an improved steam generator that converts the facility's steam to dry steam for an immediate cleaning solution. The new system will result in a more efficient cleaning method that also has greater sanitization capability and a reduced carbon footprint, all within the boundaries of a safer manufacturing setting at Kellogg's.

...The Kellogg's Student Design Team



Mr. Keene

Prof. Wright

Using the plant's steam distribution system as the source, create a portable dry steam unit to clean the plant's processing equipment. This system will connect into the distribution system and convert the facility's saturated steam into the dry superheated steam used to spray on mechanical equipment for cleaning and sanitization. This will improve the production line cleaning process, safety, and sanitation efficiency.

Eddie Keene
Battle Creek Plant Manager
The Kellogg Company

Project Sponsor
The Kellogg Company
Battle Creek, Michigan

Professional Advisors
Mr. Eddie Keene
Mr. Kevin Ullrey

Faculty Advisor
Prof. Neil Wright

Team Members and Home Towns
David Goshgarian
Troy, Michigan

Brandon Gray
Woodhaven, Michigan

Jeongseop (Peter) Lee
Seoul, South Korea

Chad Payne
Shelby Township, Michigan

Kellogg's: Electrostatic Charging of Materials

The Kellogg Company is the world's leading manufacturer of cereal and convenience foods which include cookies, crackers, toaster pastries, and several other on-the-go treats. The company was founded in Battle Creek, Michigan in 1906. The first factory was originally known as the Battle Creek Toasted Corn Flakes Factory and later assumed the name of its founder, W.K. Kellogg. He began to expand his product worldwide in 1914, building factories in England and Australia. Even after the death of W. K. Kellogg, the company continued developing globally, starting new operations in Latin America and Asia.

Our design problem concerned finding and applying new solutions to reduce product waste at the original factory in Battle Creek. Specifically, the goal was to reduce waste due to the overspray of fondant during application onto shredded wheat. The design aims to implement electrostatic nozzles in order to charge the fondant before it is expelled, therefore creating an attraction between the fondant and shredded wheat. Electrostatic spraying is used in painting applications, such as the automotive industry. The electrostatically charged particles are attracted evenly to the surface, creating a uniform coverage. This technique would create a better overall coating of frosting on the biscuit. Also, this would reduce waste from the sprayers and lower maintenance costs, allowing Kellogg to increase its productivity.

...The Kellogg's Student Design Team


Mr. Keene


Mr. Ullrey


Prof. Brereton

Impact on the Company

Electrostatically charging materials will improve product quality and product yield by improving the adherence of the sprayed material to the original food. Improved yield results in reduced overspray along with reducing drift/ waste. Improving the sprayed material control will also improve sanitation and maintenance. Sanitation is required to keep conveying equipment lean and tracking. When the overspray is not properly removed it results in stretched belts which have to be replaced and damage to other equipment in the area.

Mr. Eddie Keene
Battle Creek Plant Manager
The Kellogg Company

Project Sponsors
The Kellogg Company
Battle Creek, Michigan

Professional Advisors
Mr. Eddie Keene
Mr. Kevin Ullrey

Faculty Advisor
Prof. Giles Brereton

Team Members and Home Towns
Alex Gage
Traverse City, Michigan

Alex Hsieh
Plymouth, Michigan

Brian Jansen
Jackson, Michigan

Mike Magner
Sterling Heights, Michigan

A Shell Oil Company Children's Humanitarian Project: Adapted Seating Fore the Course

The Beekman Center is part of the Lansing School District that serves students ranging from 2-26 years of age with physical and cognitive needs. Clare Jorgensen, a physical therapist at Beekman, cares for 21-year-old Ryan Politi, who attends the center. Ryan suffers from spastic quadriplegia cerebral palsy. He has spastic movement and little control of his limbs. Ryan is unable to speak clearly and has a bony structure affecting posture and positioning. Outside of school, one of Ryan's favorite things to do is to go golfing with his parents. While he cannot actively participate, Ryan loves the game of golf and spending time outside with his family. Ryan has outgrown the car seat his parents previously used to support him in the golf cart and is in need of a replacement. Commercial seating is not available to accommodate the special needs of Ryan and others with a similar condition. As Ryan's physical therapist, Clare approached MSU's College of Engineering with the task of developing a seat that meets the needs of Ryan, his caregivers, and parents.

The seat provides an ergonomic solution to the process of placing Ryan into and out of a golf cart. Because it is fully adjustable, Ryan will be able to comfortably view and play with the telescoping and swivel features of the seat. The structure meets safety regulations and can be quickly attached to the cart. The seat's universal design allows it to be used with all existing cart models. This seat is engineered to provide Ryan and his family with years of use and will potentially assist others with similar needs.

...The Shell Oil Company Student Design Team

Beekman Center
Committed to Quality

special tomato

Radical Golf Carts

Ms. Jorgensen

Prof. Thompson

Ryan is a young adult with spastic quadriplegia cerebral palsy which affects his posture, motor control and mobility. He loves the sport of golf and enjoys riding in the golf cart to watch his family play. Ryan has experienced rapid growth and physical changes over the past three years that have affected safe seating in a golf cart. An adapted, removable support seat to fit in a golf cart will allow Ryan to join his family on the golf outings that he loves.

Ms. Clare Jorgensen
Physical Therapist
Marvin E. Beekman Center

Project Sponsor
Marvin E. Beekman Center
Lansing, Michigan

Professional Advisor
Ms. Clare Jorgensen

Faculty Advisor
Prof. Brian Thompson

Team Members and Home Towns
Michael Conboy
Bolingbrook, Illinois

Kylar Dailey
Jackson, Michigan

Brad Legris
Brighton, Michigan

Chris Lutz
Bay City, Michigan

Andy Starck
St. Johns, Michigan

A Shell Oil Company Children's Humanitarian Project: Solar Heated Vermicomposting Bin

Woodcreek Magnet Elementary School is dedicated to inspiring students to investigate and invent through the study of math, science, and engineering. Woodcreek has been recognized as a National Magnet School of Distinction (2005-06), the Nation's Top New and Emerging Magnet School (2007-08), and a National Magnet School of Excellence (2006-09).

Woodcreek hopes to spark the creativity of its 5th grade science and engineering students by directly involving Michigan State Mechanical Engineering seniors in the students' curricula of alternative energy and sustainable living. The school involves students in a recycling and conservation program that ingrains in the students the value of sustainable living. As part of the program, the students compost their lunch and paper waste using vermicomposting (composting with worms) in two large outdoor bins.

Currently, Michigan weather only allows the school to compost in the warmer months of the year because the soil and worms freeze during the winter months. To solve this problem, the MSU design team, together with the Woodcreek students, developed a simple and creative solution to keep the school's vermicomposting bins operational during the cold winter months by using only the energy of the sun. The solution was reliable, safe, easy to maintain, and powered by solar energy. Aside from greatly increasing the output of compost that the students can sell to the local community, this project guided the students through the engineering processes that make harnessing solar energy possible and encouraged both creative and critical thinking from the students

...The Woodcreek Elementary School Student Design Team

Ms. Graham

Prof. Thompson

The Solar Heated Vermicomposting Bin Project has given our fifth graders the opportunity to think and work alongside 'real' engineers. This project has captured the imagination and interest of students by actively involving them in the design process. It is a positive experience that builds not only their understanding of the elements of engineering but gives them practice in teamwork and helps them to see that they can indeed work together to find solutions to help our environment.

The solar heated bin will allow the red worms to continue to consume organic material during the cold Michigan winters and the carefully designed system, which emphasizes simplicity, can easily be duplicated at other school sites in Michigan.

Ms Diane Graham
Principal, Woodcreek Elementary School

Project Sponsors
Woodcreek Elementary School
Lansing, Michigan

Professional Advisor
Ms. Diane Graham

Faculty Advisor
Prof. Brian Thompson

Team Members and Home Towns
Luis Alvarez
Lansing, Michigan

Katelin Friederichs
East Lansing, Michigan

Rachel Jacquin
East Lansing, Michigan

Andrew Nolan
Lansing, Michigan

American Hydromech: Electric Motor Driven Vacuum Pump – Benchmark Study

American Hydromech is a product design and research company. This project includes a benchmarking study on vacuum pumps for automotive applications. In a spark ignition engine, a vacuum is created because the engine intake air is throttled. The vacuum is used in numerous control systems throughout the vehicle. Some examples of these systems include HVAC controls, brake boosters, and power door locks.

Recently, automotive companies have begun using alternative sources of power in light vehicles such as compression ignition engines (Diesel), boosted spark ignition engines, hybrid and electric systems. In these vehicles the engine does not create a sufficient vacuum to supply current control systems. In order to alleviate this problem, some manufacturers have added mechanically or electrically driven vacuum pumps to their vehicles to provide an adequate vacuum source.

The benchmarking study included research on both historical and future applications of vacuum controls and vacuum pumps, alternative industries' uses of vacuum pumps, and the state-of-the-art vacuum pumps. Current vacuum pumps on the market were also tested with respect to flow rate, ultimate pressure, and power draw to gather information on pump type and performance. Finally, a tear-down analysis was conducted to determine the materials used in pump manufacture.

Based on testing and research, recommended design alternatives were determined in order to increase useful life and reduce scheduled maintenance, noise, ownership and maintenance costs, and weight.

... The American Hydromech Student Design Team

Mr. Droste

Prof. Loos

As the automotive industry and products evolve, it becomes increasingly critical to identify trends, best practices and best in class components. This project explores the history, performance and state-of-the-art of vehicle mounted vacuum pumps and the systems they power, with an eye toward emerging system trends that would influence the need or rating criteria for these pumps. A search of unrelated industries for discovery of uncommon design features will also be conducted.

Mr. Tim Droste
Senior Engineer
American Hydromech

Project Sponsor
American Hydromech
Howell, Michigan

Professional Advisor
Mr. Tim Droste

Faculty Advisor
Prof. Alfred Loos

Team Members and Home Towns
Tom Dennis
West Bloomfield, Michigan

Neil Jessel
Portage, Michigan

Hasib Mohammed
Okemos, Michigan

Jonathan Pishney
Traverse City, Michigan

Pepsi Beverages Company: Mechanical Layer Picking Design for Shell Handling

Pepsi Beverages Company (PBC), a newly formed division of PepsiCo, is the leading distributor of food and beverages in North America. This division handles almost 75 percent of the region's beverage volume.

In all of PBC's larger distribution centers, specific customer orders require custom pallets of product. These unique orders are constructed through the use of a mechanical layer picking device – known as The Claw – which is attached to a standard forklift. This system allows for labor and time efficient movement of product.

Originally, The Claw successfully lifted approximately half of the products required for custom pallets, highlighting a need for increased lifting capabilities. This project charged the team to design a solution that could flexibly handle a wider range of product types included in custom-built pallets. The project constraints required a unique solution; redesign had to accommodate existing shells and pallet configurations. Additionally, due to economic constraints, the solution called for a minor modification of the present system rather than a new process. Adjustments allowed for a vast increase in efficiency of PBC's Direct Store Delivery network.

The team's solution increased pallet loading accuracy, while reducing labor costs and workers' compensation claims, and helped make PBC a more productive, more efficient, and safer company.

...The Pepsi Beverages Company Student Design Team

Mr. Curtis

Prof. Shaw

This project will positively influence Pepsi by increasing the efficiency of the Direct Store Delivery network. Not only will labor costs and workers' compensation claims be reduced, but overall loading accuracy will be increased. By redesigning the existing mechanical layer pick device to handle more existing SKUs, Pepsi will now be able to build more orders via machine in layer quantities versus building manually case by case.

Mr. Eric Curtis
Pepsi Beverages Company

Project Sponsor
Pepsi Beverages Company
Howell, Michigan

Professional Advisor
Mr. Eric Curtis

Faculty Advisor
Prof. Steven Shaw

Team Members and Home Towns
Nate Geib
St. Joseph, Michigan

Kyle Kocarek
Naperville, Illinois

Eric Massa
Rochester, Michigan

Sarah Stoner
Rochester, Michigan

Justin Ward
Fenton, Michigan

Chrysler: Minivan/SUV Seat Feature Future Needs

Chrysler, one of the Big Three American automakers, is headquartered in Auburn Hills, Michigan. The company was founded by Walter P. Chrysler on June 6, 1925. Chrysler has proven its resiliency through the recent economic hardships and has bounced back as a major competitor in the automotive market. Since 2010 Chrysler has been moving in a positive direction with a major increase in sales and employment.

Chrysler produces a large line of sedans, minivans, and SUVs. It is widely known for its innovation in the minivan market with features such as The *Stow'n Go*, *Easy Out Roller*, and *Swivel'n Go* seats. The company prides itself on the minivan because it was the first to produce them in 1984. Now the minivan is manufactured by just about every company and its popularity has spread worldwide.

Due to the current market decline and the recession hitting young families particularly hard, Chrysler is looking for new innovative ideas to attract customers to the minivan/SUV market. The focus is to market and produce a new seating feature for the 2nd and/or 3rd row that would appeal to the younger generation. A lot of flexibility was provided to the design team by Chrysler in order to expand the boundaries of innovation while keeping in mind the main factor of delighting the customer. Research was conducted to understand the needs of the minivan/SUV market, and ideas were developed and evaluated based upon those needs.

...The Chrysler Student Design Team

CHRYSLER

Ms. Badgley

Mr. Bittinger

Prof. Naguib

Chrysler is known for innovation in the minivan market, such as *Stow'n Go, Easy Out Roller,* and *Swivel'n Go* seats. These innovations have made Chrysler's Dodge Caravan a long-time champ of the segment. However, the minivan market has been shrinking in recent years, as the recession has hit young families particularly hard. This has brought a renewed need for innovative ideas for seating features that meet the needs, wants, and desires of young families.

Jennifer Badgley
HMI & Comfort Engineer
Chrysler Seating Group

Project Sponsor
Chrysler Group LLC
Auburn Hills, Michigan

Professional Advisors
Ms. Jennifer Badgley
Mr. Scott Bittinger

Faculty Advisor
Prof. Ahmed Naguib

Team Members and Home Towns
Kyle Anderson
Livonia, Michigan

Harold Hill
Farmington Hills, Michigan

Nick Huehl
Chelsea, Michigan

Manpreet Singh
Battle Creek, Michigan

The Dow Chemical Company:
External Basement Insulation Paneling

The Dow Chemical Company has a deep history of utilizing the power of science and technology and uniting it with the "human element" in order to pave the progress of humankind. Long connecting chemistry and innovation, many of the world's most challenging problems are continually being addressed in order to provide for a better today and tomorrow. Founded in 1897, The Dow Chemical Company is now a diversified industry leader for specialty chemicals, advanced materials, agrosciences, and plastics, spanning over 160 countries and continuing to broaden into sectors such as electronics, water, coatings, and energy.

Energy, in particular, has become one of the fastest growing industries both in relative size and importance. Currently, new residential energy codes advocated by the US DOE are being adopted by many states. Basement heat loss has led to an increased importance for the installation of basement insulation systems. Presently, a major issue with implementation of external insulation has been the major cost factor associated with protecting the exposed above-grade portion of the insulation assembly and the aesthetic look featured in making a relatively inexpensive, yet strong and durable covering.

At this time, a wide array of potential solutions are applied; however, each potential solution results in a bevy of prospective issues and difficulties, including ease of implementation, time duration of assembly, and effectiveness of the final product. Research into alternative designs and materials was performed in order to find the most effective

product. Prototypes were constructed and tested utilizing known industry standards and real-world scenario testing. Constraints such as aesthetics, cost, and durability heavily influenced the final design.

...The Dow External Insulation Student Design Team


Mr. Alderman


Prof. Loos

Energy efficiency is an ever increasing factor in homes today, and reducing heat loss is critical to every home's energy usage. Finding a durable insulation solution for the foundation is a component missing from the consumer market. There is great opportunity to develop a solution that could be used on nearly every home in the world.

Mr. Adam Alderman
Dow Water and Process Solutions

Project Sponsor
The Dow Chemical Company
Midland, Michigan

Professional Advisor
Mr. Adam Alderman

Faculty Advisor
Prof. Alfred Loos

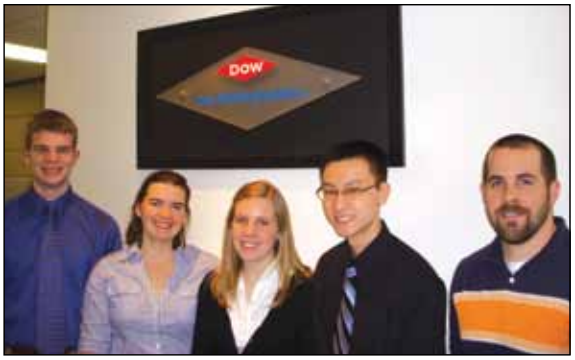
Team Members and Home Towns
Andrew Chiesa
Dearborn, Michigan

Logan Larson
Midland, Michigan

Kyle Spiekermann
Plainwell, Michigan

Erik Sundberg
Elk Rapids, Michigan

The Dow Chemical Company:
Interior Basement Insulation Panel



Dow Chemical has been a household name for home insulation since it first debuted Styrofoam in 1942. Since then, Dow has expanded its product line to include spray foams and polystyrene batting for use as interior insulation within stud walls.

Changing energy codes and increased consumer demand for energy efficiency has inspired the push for better insulation products that reduce the energy costs for the homeowner while maintaining an aesthetically pleasing living space. Beginning in 2011, the interior of basements in new homes must be insulated if external insulation is not used, because heat loss from uninsulated basements can account for up to a third of a home's energy losses.

Basements pose a challenge to existing insulation paradigms—unlike attics and interior walls, basement insulation strategies must account for moisture from the foundation as well as being functional, safe and fire-resistant while maintaining a traditional appearance.

The design team researched current strategies for insulating basements, attics, crawlspaces, and interior walls in order to understand the available materials and installation methods. The goal was to create an easy-to-install solution that requires no maintenance over its lifespan, is cost-competitive with existing insulation strategies, is simple to manufacture with Dow's existing facilities, and meets the new insulation requirements.

...The Dow Interior Basement Insulation Team


Prof. Mrozowski


Mr. Rokosz


Prof. Loos

Project Sponsor
Dow Chemical
Midland, Michigan

Professional Advisor
Mr. Matt Rokosz

Faculty Advisor
Prof. Alfred Loos

Technical Advisor
Prof. Tim Mrozowski

Team Members and Home Towns
Darren Fung
Flint, Michigan

Courtney MacDonald
Katy, Texas

Dan Tepe
Cincinnati, Ohio

Sara Wiederoder
Midland, Michigan

Ford: GTDI Evaporative System Design Project

Since its founding 1903, Ford has been dedicated to producing the highest quality automobiles. Today, Ford is the second largest automaker in the United States and the fifth largest in the world. Ford plans to continue its production of quality, affordable automobiles.

An evaporative emissions system helps to protect the environment by storing fuel vapors in a carbon canister in the fuel tank. At optimum driving conditions, the carbon canister will release these vapors to the engine to be combusted. Due to pressure differentials in the system, a dual-path evaporative emissions system is needed for a turbocharged engine.

This project involves consolidating the system currently in use by Ford into one that is simpler, while retaining similar flow, size, and quality properties. This will reduce costs and time in the manufacture and assembly of a vehicle.

Research on flow properties, valve designs, and materials was performed in order to find the optimum design. The new system was then designed in CAD programs and subjected to incompressible flow analysis. Ford's quality standards of 10 years/ 120,000 miles were strictly adhered to in this process.

...The Ford Motor Company Student Design Team

Mr. Bohr

Prof. Naguib

Currently a vacuum in the intake manifold is used for the evaporative emissions system of a vehicle to purge off a carbon canister. A GTDI engine utilizes turbochargers to increase the intake pressure to a positive value which cannot be utilized by the emissions system. Valves and special components are therefore needed to redirect the flow path through the turbocharger to enable the vacuum to be utilized when in boost. Currently these valves and special components are separate parts and are utilized similarly across many vehicle models. Consolidating the separate special emission components will reduce costs, complexity, potential leak paths from line connections, and provide increased flexibility for packaging in the vehicle.

Scott Bohr
Evap Technical Specialist
Ford Motor Company

Project Sponsor
Ford Motor Company
Dearborn, Michigan

Professional Advisor
Mr. Scott Bohr

Faculty Advisor
Prof. Ahmed Naguib

Team Members and Home Towns
Dave Kempf
Holland, Michigan

Adam Nelligan
Naperville, Illinois

Amar Shah
West Bloomfield, Michigan

Brian Smith
Novi, Michigan

Joe Wesorick
Rockford, Michigan

Ford: Hybrid Electric Vehicle Evaporative Emissions System

Ford Motor Company has displayed its commitment to improving gas mileage and protecting the environment by being a frontrunner in hybrid technology for cars. In 2004 the Escape hybrid became the first hybrid made by an American manufacturer and the first SUV hybrid. In addition to being the first of its kind, the hybrid Escape also won the 2005 North American Truck of the Year award.

In order to maintain the environmental integrity of the vehicle, evaporation emissions systems are required for every vehicle. In most cases these systems are tested using a pressure difference created by the engine. However, in a hybrid vehicle the engine is not always employed, therefore a different solution is required. Currently, an expensive vacuum pump is used to create a pressure change in the system.

Research on the use of a vacuum reservoir system was conducted to provide a vacuum for the system that provides an inexpensive and reliable alternative to the vacuum pump. An algorithm was then developed to determine the required size of the vacuum reservoir for each different emissions system.

... The Ford Motor Company Student Design Team

Mr. Pearce

Prof. Wright

The function of the evaporative emissions system on an HEV is the same as that of a standard vehicle. The evaporative emissions system requires vacuum for specific required functions. Typically this is achieved by engine vacuum, but with HEVs the engine vacuum is not always readily available. To provide readily available vacuum, a vacuum reservoir is proposed which will provide the low pressure for the evaporative emissions system. The vacuum reservoir system will reduce costs and increase reliability due to replacing a vacuum pump which is currently used in the system.

Mr. Randy Pearce
Ford Motor Company

Project Sponsor
Ford Motor Company
Dearborn, Michigan

Professional Advisor
Mr. Randy Pearce

Faculty Advisor
Prof. Neil Wright

Team Members and Home Towns
Rachel Maurer
Novi, Michigan

Nick Mimikos
South Lyon, Michigan

John Scheifer
Frankenmuth, Michigan

Michael Thoel
Shelby Twp. Michigan

GM: Redesigned Battery Seal Strategy for the Chevrolet Volt

In creating an ideal extended-range electric vehicle such as the Chevrolet Volt, General Motors hopes to help re-establish itself as an environmentally friendly car company. General Motors plans on becoming the industry leader in battery technologies and to set the standard for "green" vehicles. This will give General Motors an opportunity to display the new direction of the company's operations and management as well as the new direction of the American automotive industry.

With the influence of new technologies, companies are continually exploring new methods of improving upon designs in order to ensure the quality of products and to meet or exceed the ever-changing demands of consumers. Engineers at General Motors have determined that in order to optimize the durability and lifespan of the battery for the Chevrolet Volt, improvements in the design of the battery seal must be made.

Currently, General Motors uses a compression fit silicon seal in the battery design of the Chevrolet Volt to prevent water and environmental debris from entering the battery case during typical vehicle operation. The purpose of the project is to investigate possible alternate designs for the sealing structure other than what has already been implemented in the current production design. This new seal design will increase the efficiency and reliability of the battery module and decrease the possibility of battery failure due to damage from unforeseen environmental components.

...The General Motors Student Design Team

Mr. Herman

Prof. Bénard

The improvement/redesign of the seal for the battery of the Chevrolet Volt will potentially yield a higher quality sealing strategy for possible implementation into a future Chevrolet Volt model year vehicle while also improving the long term durability of the battery pack. This project will also give mechanical engineering students some real world exposure to engineering design and the opportunity to gain some experience working with new technologies General Motors is currently implementing in its hybrid/electric vehicles such as the Chevrolet Volt.

Mr. Andrew J. Herman
MiniBEV Pack Validation/Development Engineer
General Motors Company

Project Sponsor
General Motors Company
Warren, Michigan

Professional Advisor
Mr. Andrew Herman

Faculty Advisor
Prof. André Bénard

Team Members and Home Towns
Hassan Alzayer
Qatif, Saudi Arabia

Peter Anthony
Farmington Hills, Michigan

Andre Chanyawatanakul
West Bloomfield, Michigan

Kevin Compau
Oxford, Michigan

Sachin Golhar
Portage, Michigan

A Shell Oil Company Children's Humanitarian Project: Sensory Garden Bridge

Heartwood School in Mason, Michigan provides an authentic learning experience for students throughout Ingham County who require unique attention. Since the students of Heartwood suffer from moderate to severe physical or cognitive impairments, the school participates in the Mobility Opportunities Via Education/Experience Program (MOVE). This unique program emphasizes the importance of stimulation and movement of students who are normally limited by a wheelchair. Involvement in the program usually results in dramatic improvement in overall function and most students gain more independence and movement.

A structure for the sensory garden of Heartwood School was designed and installed to stimulate tactile, auditory, visual and olfactory senses which allow students with disabilities to enjoy nature in a more enhanced yet safe learning environment.

During the semester, the project became an inter-disciplinary endeavor, including interaction with several departments on campus, especially the MSU Horticulture Club. The purpose of the bridge is to serve as a pathway through the sensory garden and entice the students to take advantage of its many features while challenging the students to refine their functional mobility skills through sensory exercise.

...The Heartwood School Student Design Team

Ms. Janicki

Prof. Thompson

This project will enhance the educational day of the physically and cognitively impaired student. Through seeing, smelling, listening, feeling and tasting, students' awareness is heightened and they enjoy positive learning experiences. Increased balance and physical abilities will also bring new independence for fuller participation and involvement in family and school life. By navigating across a structure into the garden, our students will learn skills that will help them integrate into the larger community.

Ms. Joanne Janicki

Project Sponsor
Heartwood School
Mason, Michigan

Professional Advisor
Ms. Joanne Janicki

Faculty Advisor
Prof. Brian Thompson

Team Members and Home Towns
Brent Ewald
Ann Arbor, Michigan

Andrew Kappler
Zeeland, Michigan

Lindsay Smith
Sterling Heights, Michigan

Alexander Daniel Suradja
Surabaya, Indonesia

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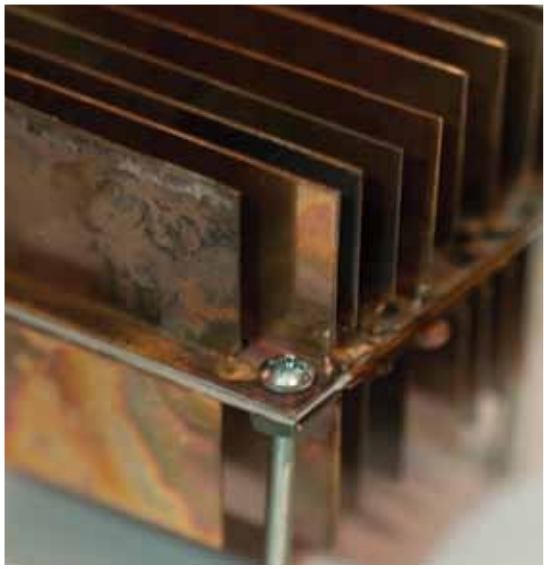


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Norfolk Southern Railway has a proud history, and today's NS includes not only the Norfolk and Western Railway and Southern Railway from which its name arose, but also all or large parts of many other historic railroads, such as the Pennsylvania Railroad, 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.

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Maureen Blazer-Adams
Director, Design Day
2244 Engineering Building
Michigan State University
East Lansing, Michigan 48824
(517) 432-6583 adamsme@egr.msu.edu